Operating Instructions

Gas engine
12 V 4000 L62
16 V 4000 L62

MS150033/04E

Power. Passion. Partnership.

Printed in Germany

© 2012 Copyright MTU Friedrichshafen GmbH

This Publication is protected by copyright and may not be used in any way whether in whole or in part without the prior written permission of MTU Friedrichshafen GmbH. This restriction also applies to copyright, distribution, translation, micro-filming and storage or processing on electronic systems including data bases and online services.

This handbook is provided for use by maintenance and operating personnel in order to avoid malfunctions or damage during operation.

Subject to alterations and amendments.

Table of Contents

1 Safety

1.1 General conditions 5
1.2 Personnel and organizational requirements 6
1.3 Transport 7
1.4 Safety regulations for startup and operation 8
1.5 Safety requirements for maintenance and repair work 9
1.6 Fluids and lubricants, fire prevention and environmental protection 12
1.7 Conventions for safety instructions in the text 15

2 Product Summary

2.1 Engine – Overview 16
2.2 Engine side and cylinder designations 18
2.3 Engine – Main dimensions 19
2.4 Ignition order 20
2.5 Technical Data 21
2.5.1 Runtimes at partial load 21
2.5.2 12 V 4000 L62, 16 V 4000 L62 engine data, fuel optimized (TA-Luft) 22
2.5.3 12V 4000 L62, 16V 4000 L62 engine data, emissions-optimized (1/2 TA-Luft) 26
2.6 Monitoring, Control and Regulation Equipment 30
2.6.1 Gas engine phase 3 system – Overview 30
2.6.2 Control cabinet MIS – Overview 32
2.6.3 Purpose of the units 33

3 Operation

3.1 Putting the engine into operation after extended out-of-service-periods (>3 months) 37
3.2 Putting the engine into operation after scheduled out-of-service-period 38
3.3 Control, starting and stopping sequences 39
3.4 Starting the engine 40
3.5 Operational checks 41
3.6 Stopping the engine 42
3.7 Emergency stop 43
3.8 After stopping the engine – Engine remains ready for operation 44
3.9 After stopping the engine – Putting the engine out of operation 45

4 Maintenance

4.1 50-hours check 46
4.2 Maintenance task reference table [QL1] 47

5 Troubleshooting

5.1 Fault indication on SAM display 48
5.2 SAM – Fault messages 52
5.3 Engine governor – Fault messages 102

6 Task Description

6.1 Engine 133
6.1.1 Engine – Barring manually 133
6.1.2 Checking machine room for smell of gas 134
6.2 Crankcase Breather 135
6.2.1 Oil separator – Filter replacement 135
6.3 Ignition System 137
6.3.1 Ignition system – Ignition timing check 137
6.3.2 Spark plug connector – Replacement 138
6.3.3 Spark plug connector – Removal and installation 139
6.3.4 Spark plug – Replacement 141
6.3.5 Spark plug – Removal and installation 142
6.4 Valve Drive 144
6.4.1 Valve gear – Lubrication 144
6.4.2 Valve depth – Measurement 145
6.4.3 Valve clearance - Check and adjustment 148
6.4.4 Valve gear – Lubrication 151
6.4.5 Cylinder head cover – Removal and installation 152
6.5 Gas System 153
6.5.1 Gas supply – Checking gas lines for leaks 153
6.6 Air Filter 154
6.6.1 Air filter – Replacement 154
6.6.2 Air filter – Removal and installation 155
6.7 Lube Oil System, Lube Oil Circuit 156
6.7.1 Engine oil level – Check 156
6.7.2 Engine oil – Change 157
6.7.3 Engine oil – Sampling and analysis 158
6.8 Oil Filtration / Cooling 159
6.8.1 Engine oil filter – Replacement 159
6.9 Coolant Circuit, General, High-Temperature Circuit 160
6.9.1 Engine coolant – Level check 160

DCL-ID: 0000016352 - 003

6.9.2 Engine coolant – Change 161
6.9.3 Engine coolant – Draining 162
6.9.4 Engine coolant – Filling 164
6.9.5 Vent line of engine coolant circuit – Replacement 165

6.10 Low-Temperature Circuit 166
6.10.1 Mixture coolant level - Check 166
6.10.2 Mixture coolant - Change 167
6.10.3 Mixture coolant - Draining 168
6.10.4 Mixture coolant - Filling 169

6.11 Wiring (General) for Engine/Gearbox/Unit 170
6.11.1 Engine wiring – Check 170
6.11.2 Sensors – Overview 171

7 Appendix A

7.1 Abbreviations 175
7.2 MTU Onsite Energy contact / service partner 177

8 Appendix B

8.1 Special Tools 178
8.2 Consumables 182
8.3 Spare Parts 184
8.4 Index 186

DCL-ID: 0000016352 - 003

1 Safety

1.1 General conditions

General

In addition to the instructions in this publication, the applicable country-specific legislation and other compulsory regulations regarding accident prevention and environmental protection must be observed. This state-of-the-art engine has been designed to meet all applicable laws and regulations. The engine may nevertheless present a risk of injury or damage in the following cases:

- Incorrect use
- Operation, maintenance and repair by unqualified personnel
- Modifications or conversions
- Noncompliance with the Safety Instructions

Correct use

The engine is intended solely for use in accordance with contractual agreements and the purpose envisaged for it on delivery. Any other use is considered improper use. The engine manufacturer accepts no liability whatsoever for resultant damage or injury in such case. The responsibility is borne by the user alone.

Correct use also includes observation of and compliance with the maintenance specifications.

Modifications or conversions

Unauthorized modifications to the engine represent a safety risk.

MTU will accept no liability or warranty claims for any damage caused by unauthorized modifications or conversions.

Spare parts

Only genuine MTU spare parts must be used to replace components or assemblies. MTU accepts no liability whatsoever for damage or injury resulting from the use of other spare parts and the warranty shall be voided in such case.

Reworking components

Repair or engine overhaul must be carried out in workshops authorized by MTU.

TIM-ID: 0000000860 - 017

1.2 Personnel and organizational requirements

Personnel requirements

All work on the engine shall be carried out by trained and qualified personnel only.

The specified legal minimum age must be observed.

The operator must specify the responsibilities of the operating, maintenance and repair personnel.

Organizational measures

This publication must be issued to all personnel involved in operation, maintenance, repair or transportation.

Keep it at hand at the operating site of the engine so that it is available to operating, maintenance, repair and transport personnel at all times.

Use the manual as a basis for instructing personnel on engine operation and repair with an emphasis on explaining safety-relevant instructions.

This is particularly important in the case of personnel who only occasionally perform work on or around the engine. This personnel must be instructed repeatedly.

For the identification and layout of the spare parts during maintenance or repair work, take photos or use the spare parts catalog.

Working clothes and protective equipment

Wear proper protective clothing for all work.

Use the necessary protective equipment for the given work to be done.

TIM-ID: 0000000874 - 018

1.3 Transport

Transport

Only use the lifting eyes provided to lift the engine.

Only use transport and lifting devices approved by MTU.

Take the engine's center of gravity into account.

The engine must only be transported in installation position, max. permissible diagonal pull 10°.

If the engine is supplied with special aluminum foil packing, lift the engine at the lifting eyes of the bearing pedestal or use a means of transportation which is appropriate for the given weight (forklift truck).

Install the crankshaft locking device and the locking screws for the engine mounts prior to engine transportation.

Secure the engine against tilting during transport. In particular when going down inclines or ramps, the engine must be secured against moving and tilting.

Setting the engine down after transport

Only set down engine on a firm, level surface.

Make sure that the consistency and load-bearing capacity of the ground or support surface is adequate.

Never set an engine down on the oil pan unless expressively authorized to do so by MTU on a case-to-case basis.

TIM-ID: 0000002614 - 003

1.4 Safety regulations for startup and operation

Safety precautions when putting the equipment into operation

Prior to initial operation of the assembly or plant, install the assembly or unit according to the specifications and check the installation according to the MTU specifications.

Before putting the device or plant into operation, always ensure:
- that all maintenance and repair work is completed,
- that all loose parts have been removed from rotating machine components,
- that all persons are clear of the danger zone of moving machine components.

Immediately after putting the device or plant into operation, make sure that all control and display instruments as well as the monitoring, signaling and alarm systems are working properly.

Safety regulations for equipment operation

Emergency procedures must be practiced regularly.

The operator must be familiar with the controls and displays.

The operator must be familiar with the consequences of all operations to be performed.

During operation, the display instruments and monitoring units must be permanently observed with regard to present operating status, violation of limit values and warning or alarm messages.

The following steps must be taken if a malfunction of the system is recognized or reported by the system:
- inform supervisor(s) in charge,
- analyze the message,
- if required, carry out emergency operations e.g. emergency engine stop.

Engine operation

The following conditions must be fulfilled before starting the engine:
- Wear ear protectors.
- Ensure that the engine room is well ventilated.
- Do not inhale engine exhaust gases.
- Ensure that the exhaust system is free of leaks and that the gases are discharged to atmosphere.
- Mop up any leaked or spilled fluids and lubricants immediately or soak up with a suitable binding agent.
- Protect battery terminals, battery-charger terminals and cables against accidental contact.
- When the engine is running, never release coolant, oil, fuel, compressed-air or hydraulic lines.

Operation of electrical equipment

When operating electrical equipment, certain components of this equipment are live.

Observe the safety instructions for these devices.

TIM-ID: 0000023743 - 010

1.5 Safety requirements for maintenance and repair work

Safety requirements for maintenance and repair work

Maintenance and repair work may only be carried out by authorized, qualified personnel.

All work on gas-carrying components must be carried out by authorized, specialized companies.

Installation and connection of the gas supply must only be carried out by a specialized company with staff that has been trained and authorized for this task.

Before starting maintenance work, allow the engine to cool down (danger of explosion due to vapors), shut off the gas supply to the engine and activate the emergency stop at the engine interface switch cabinet (MIS) or by turning the keyswitch, if fitted.

Before starting work, relieve pressure in systems and compressed-air lines which are to be opened.

Take special care when removing ventilation or plug screws from engine. Cover the screw or plug with a rag to prevent fluids escaping under pressure.

Take special care when draining hot fluids ⇒ risk of burning.

When changing the engine oil or working on the fuel system, ensure that the engine room is adequately ventilated.

Prior to all work, allow the engine / genset to cool down.

Observe maintenance and repair instructions.

Never perform care or maintenance work with the engine running unless expressly instructed to do so.

Lock-out/tag-out the engine to preclude undesired starting.

With electric starter, disconnect the battery.

Close the main valve on the compressed-air system and vent the compressed-air line when air starters are fitted.

Disconnect the control device from the assembly or plant.

Only use adequate, calibrated tools. During assembly and disassembly, observe the specified tightening torques.

Carry out work only on assemblies or plants that are secured as specified.

Do not use lines as climbing aids.

Only use fuel lines or fuel system components that have been approved for the application in question.

Keep fuel lines and connections clean.

Always fit caps/covers to close off any openings exposed by removing or opening lines.

Take care to avoid damaging fuel lines in the course of care and maintenance work.

Ensure that all mounts and dampers are correctly installed.

Ensure that all fuel lines and pressurized oil lines have sufficient distance to other components to avoid contact with them. Do not place fuel or oil lines near hot components.

Do not touch elastomeric seals (e.g. Viton sealing rings) if they have carbonized or resinous appearance.

Note cooling period for components which are heated for installation or removal ⇒ Risk of burning!

When working high on the engine, always use suitable ladders and work platforms. Make sure components are placed on stable surfaces.

Observe special cleanness during maintenance and repair work on the assembly or plant. After completion of maintenance and repair work, make sure that no loose objects are in/on the assembly or plant.

Ensure that all personnel is clear of danger zones before turning the engine. Check that all guards have been reinstalled and that all tools and loose parts have been removed after working on the engine.

TIM-ID: 0000002818 - 004

If starters with beryllium copper pinions are installed, the following also applies:
- To avoid health risks with the pinion containing beryllium, breathing protection of filter class P2 must be worn during maintenance work. Do not blow out the interior of the flywheel housing and the starter with compressed air. The interior of the flywheel housing must be additionally cleaned with a dust-removal machine of class H.

Welding work

Never carry out welding work on the assembly or engine plant or mounted units. Cover the engine when welding in its vicinity.

Observe the following before starting welding work on the MTU electronic system:
- Switch the main power switch to "OFF".
- Disconnect the cables and the negative and positive poles of the battery.

Do not use the assembly or plant as a ground terminal.

Never place the welding cable across or near wiring harnesses of MTU plants. The welding current may otherwise induce an interference voltage in the wiring harnesses which could damage the electrical system.

If welding has to be carried out on components (e.g. exhaust manifold), these components must first be removed from the engine.

Hydraulic installation and removal

Check the tools and devices to be used for perfect operation and safe condition. Only use the specified devices for force-fitting/removing parts.

Observe the maximum press-on pressure for the device for force-fitting/removing parts.

Do not attempt to bend or exert force on H.P. lines.

Observe the following before starting the pressing procedure:
- Bleed air from the device for force-fitting/removing parts, pumps and piping at the points provided for the system concerned (e.g. open threaded vent plugs, pump until no bubbles can be discerned in the oil, close threaded vent plugs).
- During the installation procedure, screw on device with pushed-in plunger.
- During the removal procedure, screw on device with retracted plunger.

For a hydraulic installation/removal tool with central expansion pressure supply, screw spindle into shaft end until correct sealing is established.

During hydraulic installation/removal of components, ensure that no persons are in the direct vicinity of the component being pressed.

Working on electrical/electronic assemblies

Before starting any maintenance or repair work, or before switching off any electronic components necessary to carry out the work, permission must first be obtained from the relevant manager or supervisor.

Before work is carried out on the assemblies, the power supply to the relevant areas must be switched off.

Do not damage wiring during the removal work. When reinstalling, ensure that the wiring cannot be damaged during engine operation through contact with sharp edges, rubbing against a component or through contact with a hot surface.

Do not secure cables on lines carrying fluids.

Do not use cable clamps to secure the lines.

Observe the following when working with batteries:
- Avoid sparks and naked flames.
- Keep electrolyte away from the skin and clothing. Wear protective goggles.
- Do not place tools on the battery.
- Before connecting the cable to the battery, check the battery polarity.

TIM-ID: 0000002818 - 004

Only tighten union nuts of connectors with connector pliers.

On completion of all repair work, the device or system must undergo a function check.

Before replacement, ensure that spare parts are correctly stored, i.e. in particular, protected against moisture. Defective electronic components and assemblies must be suitably packed when dispatched for repair, i.e. in particular, protected against moisture and impact and wrapped in antistatic foil if necessary.

Work with laser devices

When working with laser equipment, always wear special laser-protection goggles ⇒ eye injury through strongly concentrated beam.

Laser devices must be equipped, in accordance with their class and usage, with protective devices for ensuring safe operation.

For conducting light-beam procedures and measurement work, only the following laser devices may be used:

- Laser devices in classes 1, 2 or 3A.
- Laser devices of class 3B, which have maximum output in the visible wavelength range (400 to 700 nm), a maximum output of 5 mW, and in which the beam axis and surface have been designed in such a way as to prevent any risk to the eyes.

TIM-ID: 0000002818 - 004

1.6 Fluids and lubricants, fire prevention and environmental protection

Fire prevention

Correct fuel or oil leaks immediately. Quantities of oil or fuel on hot components can cause fires – therefore always keep the engine in a clean condition. Do not leave cloths soaked with fluids and lubricants lying on or near the assembly or plant. Do not store inflammable material near the assembly or plant.

Do not weld pipes and components carrying oil or fuel. Before welding, clean with a nonflammable fluid.

When starting the engine with an external power source, connect the ground lead last and remove it first. To avoid sparks in the vicinity of the battery, connect the ground lead from the external power source to the ground lead of the engine or to the ground terminal of the starter.

Always have a suitable extinguishing agent (fire extinguisher) on hand and familiarize yourself fully with its handling.

Noise

Noise can lead to an increased risk of accidents if acoustic signals, warning shouts or sounds indicating danger are drowned.

At all workplaces with a sound pressure level over 85 dB(A), always wear ear protectors.

Environmental protection and disposal

Modification or removal of mechanical or electronic components or the installation of additional components as well as the execution of calibration processes that might affect the emission characteristics of the engine are prohibited by emission regulations. Emission control units/systems may only be maintained, exchanged or repaired if the components used for this purpose are approved by MTU. Noncompliance with these guidelines might represent a violation of the Clean Air Act and could involve the termination of the operating license by the emission authorities. MTU does not accept any liability for violations of the emission regulations. MTU will provide assistance and advice if emission-relevant components are intended to be modified. The MTU Maintenance Schedules ensure the reliability and performance of MTU engines and must be complied with over the entire life cycle of the engine.

Only fuels of the specified quality required to achieve emission limits must be used.

Dispose of used fluids, lubricants and filters in accordance with local regulations.

Batteries can be returned within the EU to MTU FN / MTU Onsite Energy free of charge for correct recycling/disposal.

Fluids and lubricants

Use only fluids and lubricants that have been tested and approved by MTU.

Fluids and lubricants must be kept in suitable, correctly labeled containers. When using fluids, lubricants and other chemical substances, follow the safety instructions that apply to the product. Take special care when using hot, chilled or caustic materials. When using flammable materials, avoid all sparks and do not smoke.

Natural gas

Observe the safety data sheet.

Caution: Highly flammable gas, forms an explosive mixture with air/oxygen!

Caution: Weak narcotic gas, risk of suffocation at very high concentration!

All gas-carrying lines must be checked for leaks prior to commissioning and at regular intervals during operation.

TIM-ID: 0000002829 - 002

Procedure in the case of accidental release of combustible gas:

- Seal point of gas escape!
- Remove ignition sources!
- Cordon off danger zone.
- Ensure sufficient ventilation!
- Do not enter danger zone before measurements have confirmed that gas concentration is not hazardous.

Biogenic gases from fermentation processes

Observe the safety data sheet.

Caution: Highly flammable gas, forms an explosive mixture with air/oxygen!

Caution: Can be life threatening depending on concentration! Can no longer be detected by sense of smell in higher concentrations.

Caution: There is always a risk of suffocation! Due to the lack of oxygen, the absorption of methane can occasionally lead to increased breathing frequency (hyperventilation) and heart rates, low blood pressure, numbness of the extremeties, drowsiness, mental confusion and loss of memory!

Tendency to segregate. In low-lying areas of the plant, carbon dioxide enrichment is possible.

All gas-carrying lines must be checked for leaks prior to commissioning and at regular intervals during operation.

Procedure in the case of accidental release of combustible gas:

- Seal point of gas escape!
- Remove ignition sources!
- Cordon off danger zone.
- Ensure sufficient ventilation!
- Do not enter danger zone before measurements have confirmed that gas concentration is not hazardous.

Used oil

Used oil contains combustion residue harmful to health.

Rub your hands with skin protection cream.

Wash your hands after contact with used oil.

Lead

- When working with lead or lead-containing compounds, avoid direct contact to the skin and do not inhale lead vapors.
- Prevent the buildup of white powder of lead.
- Switch on fume extraction system.
- After coming into contact with lead or lead-containing materials, wash your hands!

Compressed air

When working with compressed air, safety precautions must be constantly observed:

TIM-ID: 0000002829 - 002

- Pay special attention to the pressure level in the compressed air network and pressure vessel!
- Assemblies or plants to be connected must either be designed for this pressure, or, if the permitted pressure for the connecting elements is lower than the pressure required, a pressure reducing valve and safety valve (set to permitted pressure) must form an intermediate connection.
- Hose couplings and connections must be securely attached.
- Always wear protective goggles when blowing off tools or extracting chips.
- Provide the mouthpiece of the air nozzle with a protective disk (e.g. made of rubber).
- First shut off compressed air lines before compressed air equipment is disconnected from the supply line, or before equipment or tool is to be replaced.
- Unauthorized use of compressed air, e.g. forcing flammable liquids (danger class AI, AII and B) out of containers, results in a risk of explosion!
- Forcing compressed air into thin-walled containers (e.g. containers made of tin, plastic and glass) for drying purposes or to check for leaks, results in a risk of bursting!
- Carry out the leak check as specified.

Painting

- When carrying out painting work outside the spray stands provided with fume extraction systems, ensure that the area is well ventilated. Make sure that neighboring work areas are not impaired.
- No naked flames!
- No smoking!
- Observe all fire-prevention regulations!
- Always wear a mask providing protection against paint and solvent vapors!

Liquid nitrogen

- Store liquid nitrogen only in small quantities and always in specified containers without fixed covers.
- Avoid body contact (eyes, hands).
- Wear protective clothing, protective gloves, closed shoes and protective goggles / safety mask!
- Make sure that working area is well ventilated.
- Take great care not to subject containers, fittings and tools to impact or shock.

Acids/alkaline solutions

- When working with acids and alkalis, wear protective goggles or face mask, gloves and protective clothing.
- If acids or alkalis are spilled onto clothing, remove the affected clothing immediately!
- Rinse injured parts of the body thoroughly with clean water!
- Rinse eyes immediately with eyedrops or clean mains water!

TIM-ID: 0000002829 - 002

1.7 Conventions for safety instructions in the text

DANGER	In the event of immediate danger. **Consequences: Death or serious injury** • Remedial action
WARNING	In the event of potentially dangerous situations. **Consequences: Death or serious injury** • Remedial action
CAUTION	In the event of dangerous situations. **Consequences: Minor injury or material damage** • Remedial action
NOTICE	In the event of a situation involving potentially adverse effects on the product. **Consequences: Material damage.** • Remedial action • Additional product information

Note: This manual contains highlighted safety warnings in accordance with the US ANSI Z535 standard which begin with one of the signal words listed above depending on the severity of the hazard.

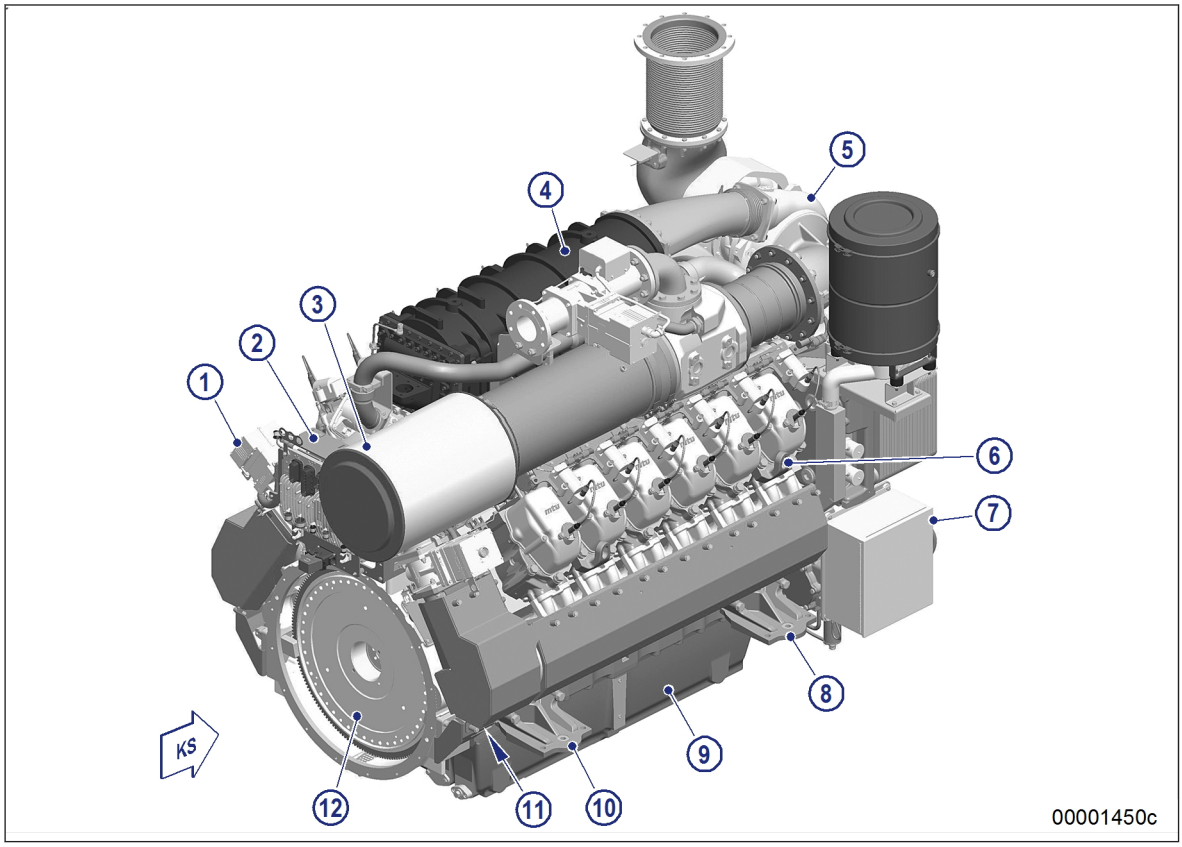
Safety instructions

1. Read and familiarize yourself with all safety notices before starting up or repairing the product.
2. Pass on all safety instructions to your operating, maintenance, repair and transport personnel.

TIM-ID: 0000000881 - 018

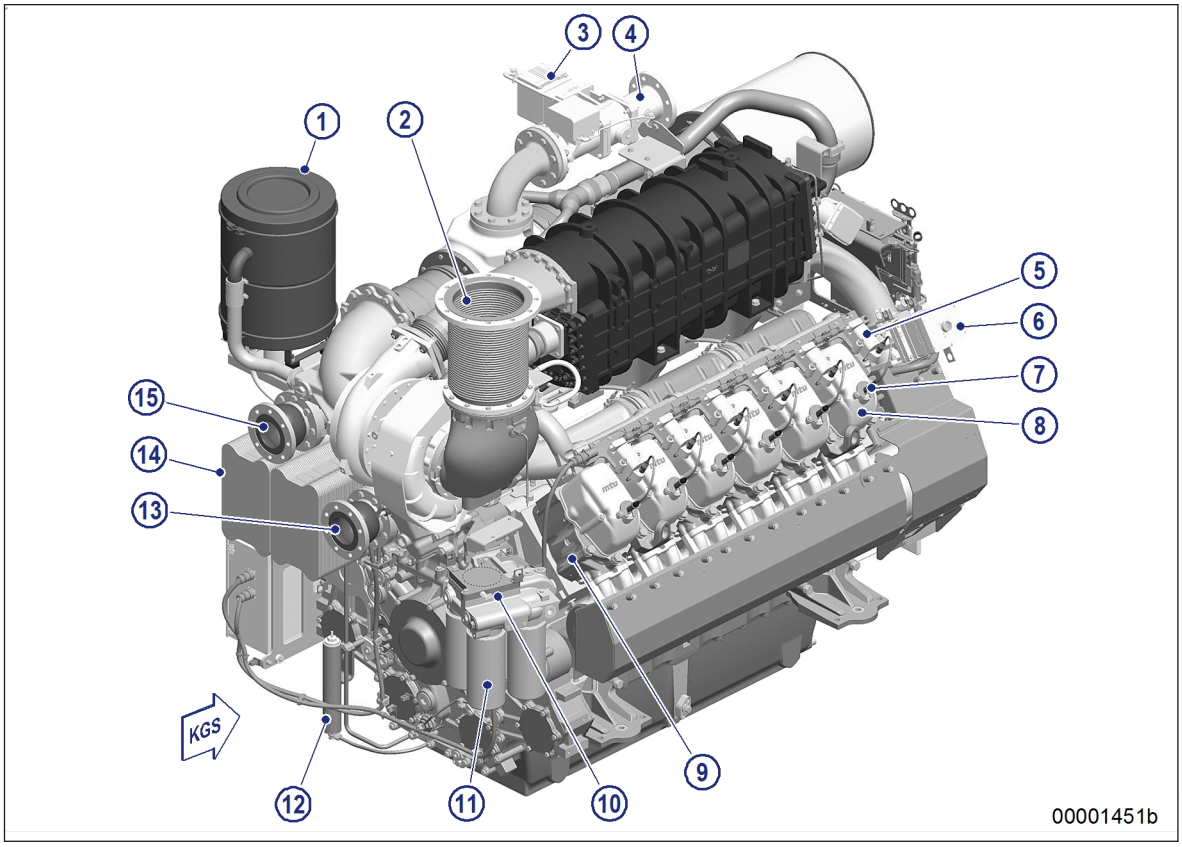
2 Product Summary

2.1 Engine – Overview



1 Throttle, A-side
2 Engine governor/engine monitoring
3 Air filter/air inlet
4 Mixture cooler
5 Exhaust turbocharger
6 Engine lifting equipment
7 Capacitor ignition system
8 Engine mounting bracket, free end
9 Oil pan
10 Engine mounting bracket, driving end
11 Starter
12 Flywheel
KS Driving end

TIM-ID: 0000038827 - 001



1 Crankcase breather, oil separator
2 Exhaust gas outlet connection
3 Gas dosing and mixing unit (Tecjet)
4 Gas inlet connection
5 Ignition coil
6 Throttle
7 Spark plug
8 Cylinder head cover
9 Cylinder head
10 Engine oil sampling connection
11 Engine oil filter
12 Oil level switch
13 Engine coolant inlet connection
14 Engine oil heat exchanger
15 Engine coolant outlet connection
KGS Free end

Engine model designation

Explanation of the engine model designation 12/16V 4000 L62/L63

12/16	Number of cylinders
V	Cylinder arrangement: V engine
4000	Series
L	Application: L = Gas engine
6	Application segment
2, 3	Design index

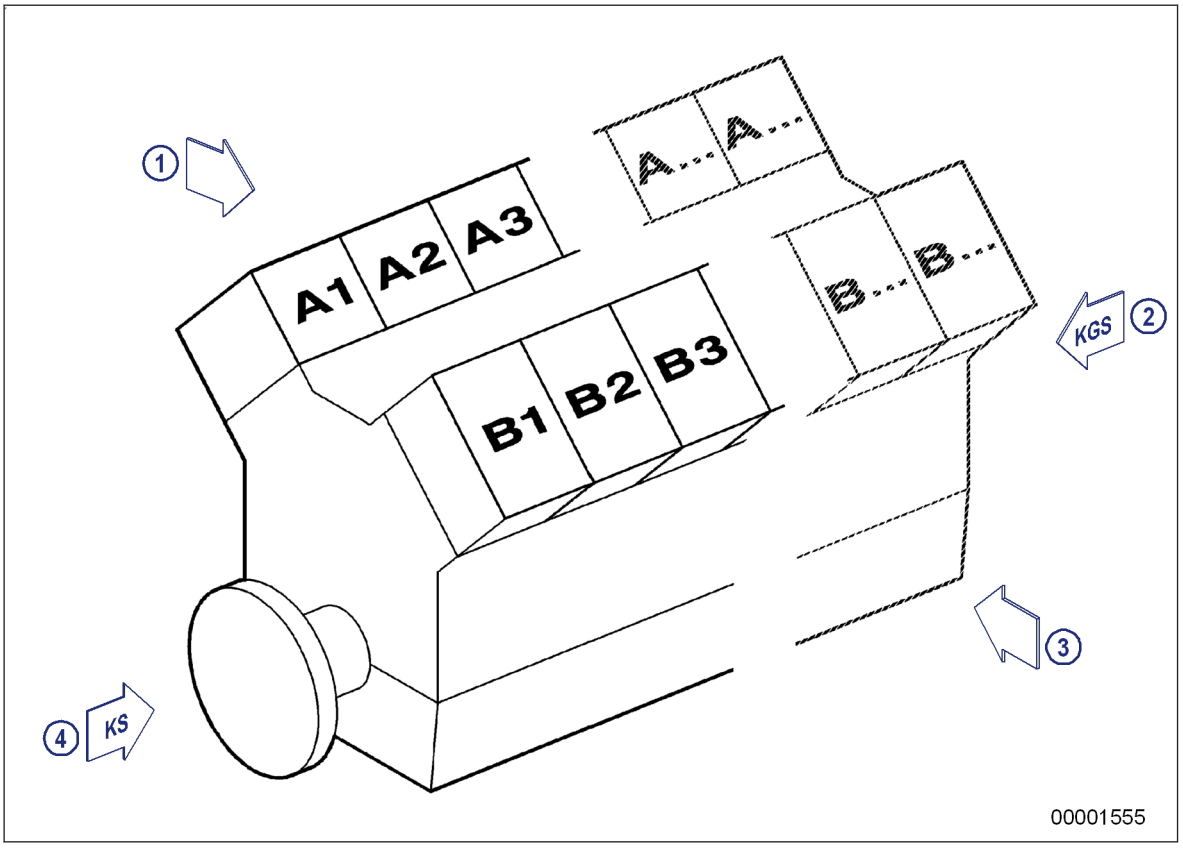
TIM-ID: 0000038827 - 001

2.2 Engine side and cylinder designations

Engine sides are always designated as viewed from the driving end (KS).

The cylinders of the left engine side are designated "A" and those of the right side "B" (as per DIN ISO 1204). The cylinders of each bank are numbered consecutively, starting with No. 1 at the driving end.

Other components are numbered in the same way, i.e. starting with No. 1 on driving end.



1 Left engine side
2 KGS = Free end
3 Right engine side
4 KS = Driving end

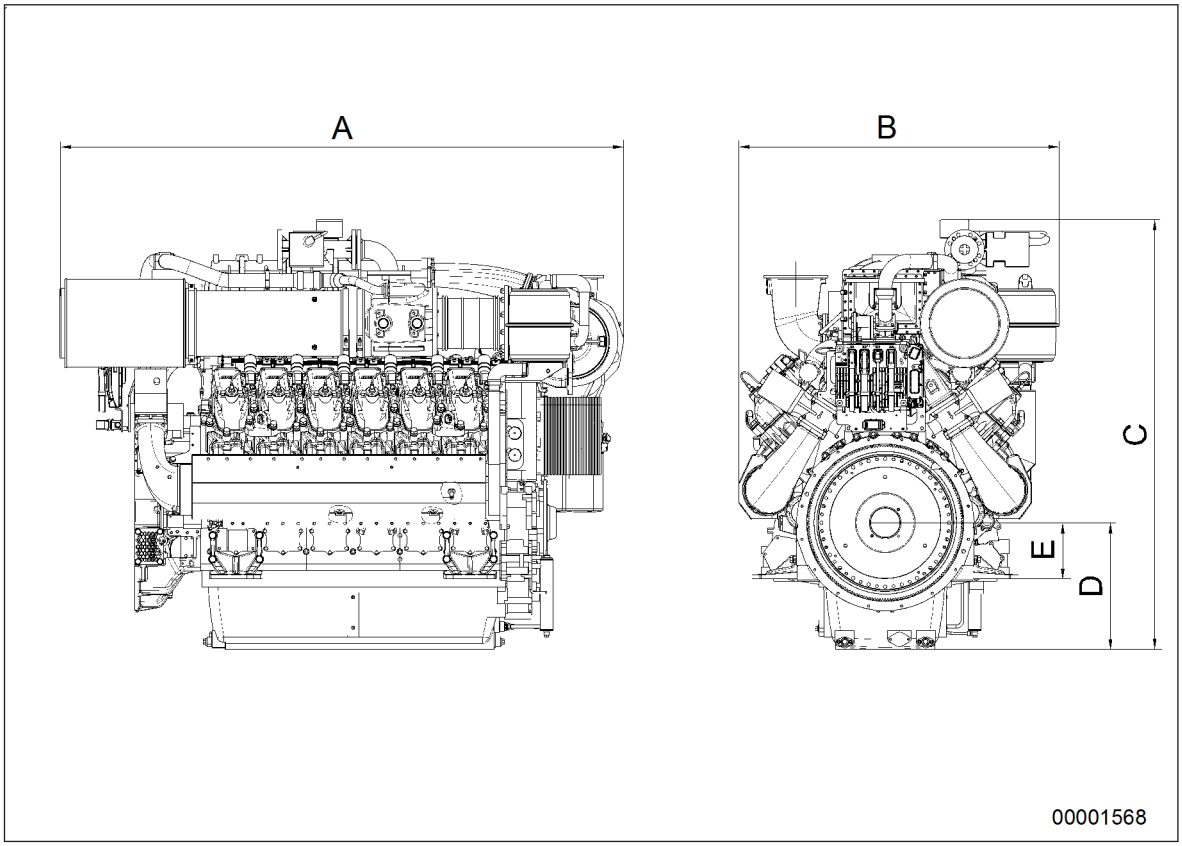
TIM-ID: 0000002185 - 010

2.3 Engine – Main dimensions

Main engine dimensions

Deviations from illustrations are insignificant.

Also valid for 16V engines.



Length (A) for 12V	approx. 2825 mm
Length (A) for 16V	approx. 3348 mm
Width (B) for 12V	approx. 1607 mm
Width (B) for 16V	approx. 1610 mm
Height (C) for 12V	approx. 2156 mm
Height (C) for 16V	approx. 2166 mm
Crankshaft center to oil pan (D)	approx. 636 mm
Crankshaft center to engine mount (E)	approx. 281 mm

Table 1: Main engine dimensions

TIM-ID: 0000038829 - 001

2.4 Ignition order

Ignition order

12 V	A1-B2-A5-B4-A3-B1-A6-B5-A2-B3-A4-B6
16 V	A1-A7-B4-B6-A4-B8-A2-A8-B3-B5-A3-A5-B2-A6-B1-B7

TIM-ID: 0000002806 - 001

2.5 Technical Data

2.5.1 Runtimes at partial load

Gas engines were designed and optimized for continuous operation at 100 % load.

The following restrictions apply to ensure maximum operational availability of the engine plant and to reduce maintenance to a minimum:

Power, referenced to nominal load	Recommended maximum runtime at this load	Recommended minimum runtime in subsequent operation at load > 50 %
0 % to 30 %	30 minutes	120 minutes
30 % to 50 %	120 minutes	120 minutes
50 % to 100 %	No restriction	No restriction

TIM-ID: 0000011224 - 002

2.5.2 12 V 4000 L62, 16 V 4000 L62 engine data, fuel optimized (TA-Luft)

Explanation:

DL Reference value: Continuous power
BL Reference value: Fuel stop power
A Design value
G Guaranteed value
R Guideline value
L Limit value, up to which the engine can be operated, without change (e.g. of power setting)
N Not yet defined value
- Not applicable
X Applicable

Reference conditions

Engine model			12V 4000 L62	16V 4000 L62
Application group			3A	3A
Intake air temperature		°C	25	25
Charge-air coolant temperature		°C	40	40
Barometric pressure		mbar	1000	1000
Site altitude above sea level		m	100	100

Table 2: Reference conditions

Power-related data (power ratings are net brake power to ISO 3046)

Number of cylinders			12	16
Rated engine speed	A	rpm	1500	1500
Mean piston speed		m/s	10.5	10.5
Continuous power as per ISO 3046	A	kW	1200	1600
Mean effective pressure (pme) (continuous power ISO 3046)		bar	16.8	16.8

Table 3: Power-related data (power ratings are net brake power to ISO 3046)

General conditions (for max. power)

Number of cylinders			12	16
Relative air humidity	A	%	30	30
Intake air temperature	A	°C	25	25
Intake air temperature, min.	L	°C	20	20
Intake air temperature, max.	L	°C	30	30
Mixture temperature after mixture cooler	A	°C	50	50
Ambient intake depression, max.	L	mbar	3	3
Pressure loss over air filter, max.	L	mbar	30	30
Exhaust back pressure, max.	L	mbar	60	60
Gas type: natural gas			X	X
Methane number, min.	L		70	70

Table 4: General conditions (for max. power)

TIM-ID: 0000010826 - 002

Consumption

Number of cylinders			12	16
Lube oil consumption after 1000 h runtime		g/kWh	0.2	0.2

Table 5: Consumption

Model-related data (basic design)

Number of cylinders			12	16
Operating method: Four-stroke cycle, Otto engine, single-acting			X	X
Combustion method: Mixture charging, spark ignition			X	X
Number of cylinders			12	16
Cylinder arrangement: V angle		Degrees (°)	90	90
Bore		mm	170	170
Stroke		mm	210	210
Displacement of a cylinder		Liters	4.77	4.77
Total displacement		Liters	57.20	76.27
Compression ratio			12.9	12.9
Standard housing connecting flange (engine main PTO)		SAE	00	00

Table 6: Model-related data (basic design)

Coolant system (HT circuit)

Number of cylinders			12	16
Coolant temperature (at engine connection: outlet to cooling equipment) (w/o antifreeze)	A	°C	90	90
Coolant temperature (at engine connection: inlet from cooling equipment (w/o antifreeze)	A	°C	78	78
Coolant temperature after engine, warning	R	°C	95	95
Coolant temperature after engine, shutdown	L	°C	98	98
Coolant temperature to enable load application, min.	L	°C	40	40
Coolant antifreeze content, max.	L	%	50	50
Coolant pump: Volumetric flow	L	m³/h	56	65
Filling pressure in cooling system (cold)	R	bar	0.5	0.5
Pressure in cooling system, max.	L	bar	6.0	6.0
Pressure loss over engine (at nominal flow rate 7.27)		bar	2.1	2.0
Thermostat: Starts to open	R	°C	68	68
Thermostat: Opening stops (thermostat fully open and bypass closed)	A	°C	74	74

Table 7: Coolant system (HT circuit)

TIM-ID: 0000010826 - 002

Coolant system (LT circuit)

Number of cylinders			12	16
Coolant temperature before mixture cooler (at engine connection: inlet from cooling equipment (w/o antifreeze)	A	°C	40	40
Coolant antifreeze content, max.	L	%	50	50
Coolant pump: Volumetric flow	A	m³/h	23	23
Pressure in cooling system, max.	L	bar	6.0	6.0
Pressure loss over mixture cooler (at nominal flow rate 8.56)		bar	0.6	0.4

Table 8: Coolant system (LT circuit)

Lube oil system

Number of cylinders			12	16
Lube oil operating temperature after oil heat exchanger, from	R	°C	82	82
Lube oil operating temperature after oil heat exchanger, to	R	°C	90	90
Lube oil operating temperature after oil heat exchanger, warning	R	°C	93	93
Lube oil operating temperature after oil heat exchanger, engine shutdown	L	°C	97	97
Lube oil pressure after oil filter		bar	5.0	5.0
Lube oil pressure after oil filter, warning	R	bar	5.0	5.0
Lube oil pressure after oil filter, shutdown	L	bar	4.5	4.5

Table 9: Lube oil system

Fuel system

Number of cylinders			12	16
Gas temperature before engine, min.	L	°C	10	10
Gas temperature before engine, max.	L	°C	40	40
Gas flow pressure before Tecjet, min.	L	mbar	80	80
Gas flow pressure before Tecjet, max.	L	mbar	200	200

Table 10: Fuel system

General operating data

Number of cylinders			12	16
Cold start capability: Air temperature (w/o starting aid, with preheating) - (case C)	R	°C	15	15
Site condition (for case C): Engine coolant temperature	R	°C	40	40
Minimum idling speed	A	rpm	1500	1500
Limit speed for overspeed alarm/emergency shutdown	L	rpm	1900	1900

Table 11: General operating data

TIM-ID: 0000010826 - 002

Starting (electric)

Number of cylinders			12	16
Starter, rated power (standard design)	R	kW	9	2 x 9
Rated starter voltage (standard design)	R	V	24	24
Starter, current consumption, max. (standard design)	R	A	2500	2 x 2500
Starting-attempt duration, max.	L	s	15	15
Number of teeth on starter ring gear			182	182

Table 12: Starting (electric)

Capacities

Number of cylinders			12	16
Engine coolant capacity, engine side (without cooling equipment)	R	Liters	200	270
Mixture coolant, engine side (without cooling system)	R	Liters	20	22
Total engine oil capacity for initial filling (standard oil system)	R	Liters	260	285
Oil change capacity, max. (standard oil system)	R	Liters	220	250

Table 13: Capacities

Weights / main dimensions

Number of cylinders			12	16
Dry engine weight (basic-configuration engine)	R	kg	5850	7750
Heaviest component to be lifted during extended component maintenance (QL3)	R	kg	415	440

Table 14: Weights / main dimensions

Exhaust emissions

Number of cylinders			12	16
Exhaust emission before catalytic converter at 100 % DL nitric oxides (NOx) (in dry exhaust gas, 5 % O2)	G	mg/m^3n	500	500
Exhaust emission before catalytic converter at 100 % DL nitric oxides (NOx) (in dry exhaust gas)	A	ppm	174	170

Table 15: Exhaust emissions

Acoustics

Number of cylinders			12	16
Exhaust noise, unsilenced - DL (sound power level LW, ISO 6798)	R	dB(A)	119	119
Genset surface noise with attenuated intake noise filter) - DL (sound power level LW, ISO 8528-10)	R	dB(A)	118	117

Table 16: Acoustics

TIM-ID: 0000010826 - 002

2.5.3 12V 4000 L62, 16V 4000 L62 engine data, emissions-optimized (1/2 TA-Luft)

Explanation:

DL Reference value: Continuous power
BL Reference value: Fuel stop power
A Design value
G Guaranteed value
R Guideline value
L Limit value, up to which the engine can be operated, without change (e.g. of power setting)
N Not yet defined value
- Not applicable
X Applicable

Reference conditions

Engine model			12V 4000 L62	16V 4000 L62
Application group			3A	3A
Intake air temperature		°C	25	25
Charge-air coolant temperature		°C	40	40
Barometric pressure		mbar	1000	1000
Site altitude above sea level		m	100	100

Table 17: Reference conditions

Power-related data (power ratings are net brake power to ISO 3046)

Number of cylinders			12	16
Rated engine speed	A	rpm	1500	1500
Mean piston speed		m/s	10.5	10.5
Continuous power as per ISO 3046	A	kW	1200	1600
Mean effective pressure (pme) (continuous power ISO 3046)		bar	16.8	16.8

Table 18: Power-related data (power ratings are net brake power to ISO 3046)

General conditions (for max. power)

Number of cylinders			12	16
Relative air humidity	A	%	30	30
Intake air temperature	A	°C	25	25
Intake air temperature, min.	L	°C	20	20
Intake air temperature, max.	L	°C	30	30
Mixture temperature after mixture cooler	A	°C	50	50
Ambient intake depression, max.	L	mbar	3	3
Pressure loss over air filter, max.	L	mbar	30	30
Exhaust back pressure, max.	L	mbar	60	60
Gas type: natural gas			X	X
Methane number, min.	L		70	70

Table 19: General conditions (for max. power)

TIM-ID: 0000010860 - 002

Consumption

Number of cylinders			12	16
Lube oil consumption after 1000 h runtime		g/kWh	0.2	0.2

Table 20: Consumption

Model-related data (basic design)

Number of cylinders			12	16
Operating method: Four-stroke cycle, Otto engine, single-acting			X	X
Combustion method: Mixture charging, spark ignition			X	X
Number of cylinders			12	16
Cylinder arrangement: V angle		Degrees (°)	90	90
Bore		mm	170	170
Stroke		mm	210	210
Displacement of a cylinder		Liters	4.77	4.77
Total displacement		Liters	57.20	76.27
Compression ratio			12.9	12.9
Standard housing connecting flange (engine main PTO)		SAE	00	00

Table 21: Model-related data (basic design)

Coolant system (HT circuit)

Number of cylinders			12	16
Coolant temperature (at engine connection: outlet to cooling equipment) (w/o antifreeze)	A	°C	90	90
Coolant temperature (at engine connection: inlet from cooling equipment (w/o antifreeze)	A	°C	78	78
Coolant temperature after engine, warning	R	°C	95	95
Coolant temperature after engine, shutdown	L	°C	98	98
Coolant temperature to enable load application, min.	L	°C	40	40
Coolant antifreeze content, max.	L	%	50	50
Coolant pump: Volumetric flow	L	m³/h	56	66
Filling pressure in cooling system (cold)	R	bar	0.5	0.5
Pressure in cooling system, max.	L	bar	6.0	6.0
Pressure loss over engine (at nominal flow rate 7.27)		bar	2.1	2.1
Thermostat: Starts to open	R	°C	68	68
Thermostat: Opening stops (thermostat fully open and bypass closed)	A	°C	74	74

Table 22: Coolant system (HT circuit)

TIM-ID: 0000010860 - 002

Coolant system (LT circuit)

Number of cylinders			12	16
Coolant temperature before mixture cooler (at engine connection: inlet from cooling equipment (w/o antifreeze)	A	°C	40	40
Coolant antifreeze content, max.	L	%	50	50
Coolant pump: Volumetric flow	A	m³/h	23	22
Pressure in cooling system, max.	L	bar	6.0	6.0
Pressure loss over mixture cooler (at nominal flow rate 8.56)		bar	0.6	0.4

Table 23: Coolant system (LT circuit)

Lube oil system

Number of cylinders			12	16
Lube oil operating temperature after oil heat exchanger, from	R	°C	82	82
Lube oil operating temperature after oil heat exchanger, to	R	°C	90	90
Lube oil operating temperature after oil heat exchanger, warning	R	°C	93	93
Lube oil operating temperature after oil heat exchanger, engine shutdown	L	°C	97	97
Lube oil pressure after oil filter		bar	5.0	5.0
Lube oil pressure after oil filter, warning	R	bar	5.0	5.0
Lube oil pressure after oil filter, shutdown	L	bar	4.5	4.5

Table 24: Lube oil system

Fuel system

Number of cylinders			12	16
Gas temperature before engine, min.	L	°C	10	10
Gas temperature before engine, max.	L	°C	40	40
Gas flow pressure before Tecjet, min.	L	mbar	80	80
Gas flow pressure before Tecjet, max.	L	mbar	200	200

Table 25: Fuel system

General operating data

Number of cylinders			12	16
Cold start capability: Air temperature (w/o starting aid, with preheating) - (case C)	R	°C	15	15
Site condition (for case C): Engine coolant temperature	R	°C	40	40
Minimum idling speed	A	rpm	1500	1500
Limit speed for overspeed alarm/emergency shutdown	L	rpm	1900	1900

Table 26: General operating data

TIM-ID: 0000010860 - 002

Starting (electric)

Number of cylinders			12	16
Starter, rated power (standard design)	R	kW	9	2 x 9
Rated starter voltage (standard design)	R	V	24	24
Starter, current consumption, max. (standard design)	R	A	2500	2 x 2500
Starting-attempt duration, max.	L	s	15	15
Number of teeth on starter ring gear			182	182

Table 27: Starting (electric)

Capacities

Number of cylinders			12	16
Engine coolant capacity, engine side (without cooling equipment)	R	Liters	200	270
Mixture coolant, engine side (without cooling system)	R	Liters	20	22
Total engine oil capacity for initial filling (standard oil system)	R	Liters	260	285
Oil change capacity, max. (standard oil system)	R	Liters	220	250

Table 28: Capacities

Weights / main dimensions

Number of cylinders			12	16
Dry engine weight (basic-configuration engine)	R	kg	5850	7750
Heaviest component to be lifted during extended component maintenance (QL3)	R	kg	415	440

Table 29: Weights / main dimensions

Exhaust emissions

Number of cylinders			12	16
Exhaust emission before catalytic converter at 100 % DL nitric oxides (NOx) (in dry exhaust gas, 5 % O2)	G	mg/m^3n	250	250
Exhaust emission before catalytic converter at 100 % DL nitric oxides (NOx) (in dry exhaust gas)	A	ppm	85	83

Table 30: Exhaust emissions

Acoustics

Number of cylinders			12	16
Exhaust noise, unsilenced - DL (sound power level LW, ISO 6798)	R	dB(A)	119	119
Genset surface noise with attenuated intake noise filter) - DL (sound power level LW, ISO 8528-10)	R	dB(A)	118	118

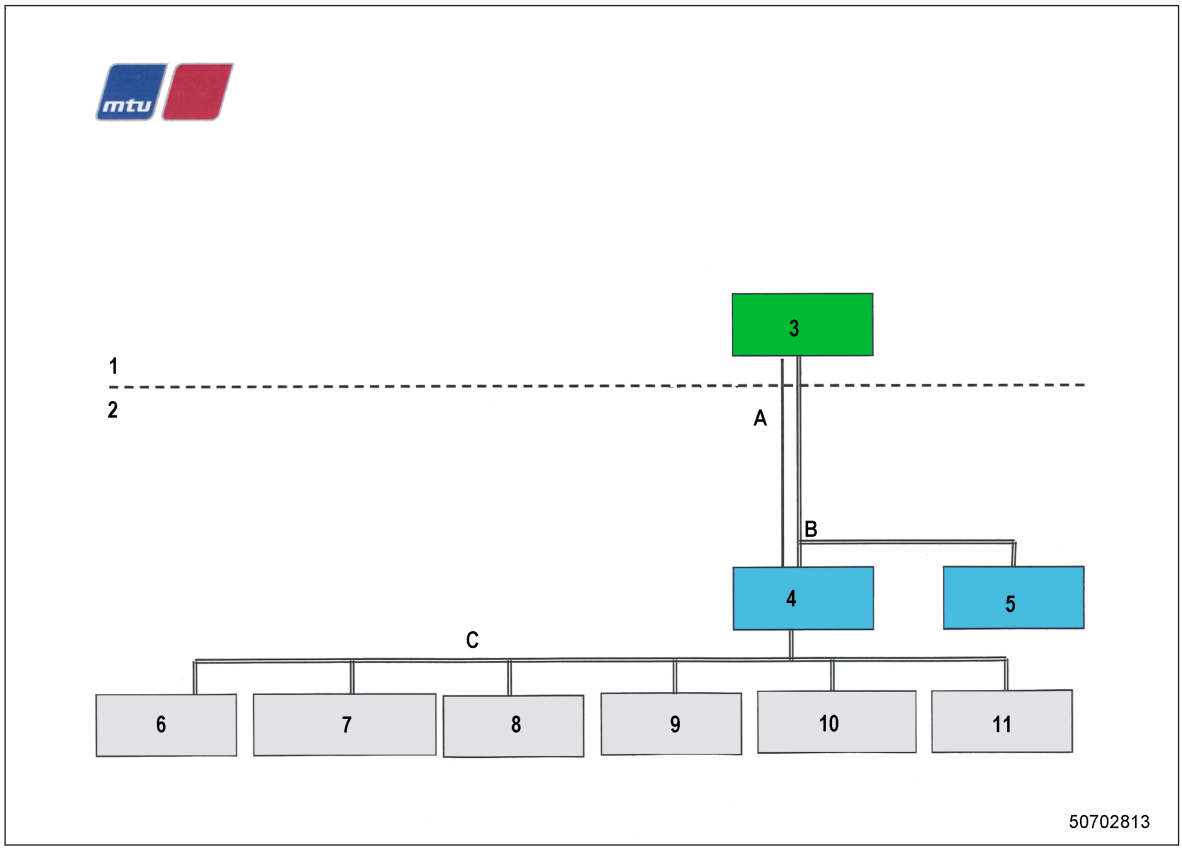
Table 31: Acoustics

TIM-ID: 0000010860 - 002

2.6 Monitoring, Control and Regulation Equipment

2.6.1 Gas engine phase 3 system – Overview

Overview



1 Genset system
2 Engine system
3 Genset
4 Engine governor
5 Engine monitoring
6 NOx sensor
7 Compressor bypass
8 Ignition
9 Knock module
10 Gas metering unit
11 Throttles

Governing/control/monitoring

Engine governor ADEC (ECU-7)

- Controls engine starting, stopping and emergency stop
- Monitors engine operating parameters
- Controls throttles and sets gas mixture for requested speed/power
- Monitors first gas solenoid in gas train to engine

SAM

- Interface module to unit control
- Monitors second gas solenoid in gas train to engine
- Diagnostic interface

Engine Monitoring Unit EMU

- Evaluation unit for PT 1000 temperature sensor to determine and monitor exhaust temperatures of individual cylinders

TIM-ID: 0000017542 - 002

Compressor bypass (F-series)

- Controls throttle reserve, blocks compressor pumps

Ignition system IC922

- Adjusts ignition timing for cylinders

Anti-knock control AKR

- Controls monitored cylinders with regard to knock characteristics. If knocking is found, the ignition timing is retarded on the cylinder in question. If this does not result in an improvement, the power is reduced.

Gas control valve TecJet50+

- Controls the required amount of gas

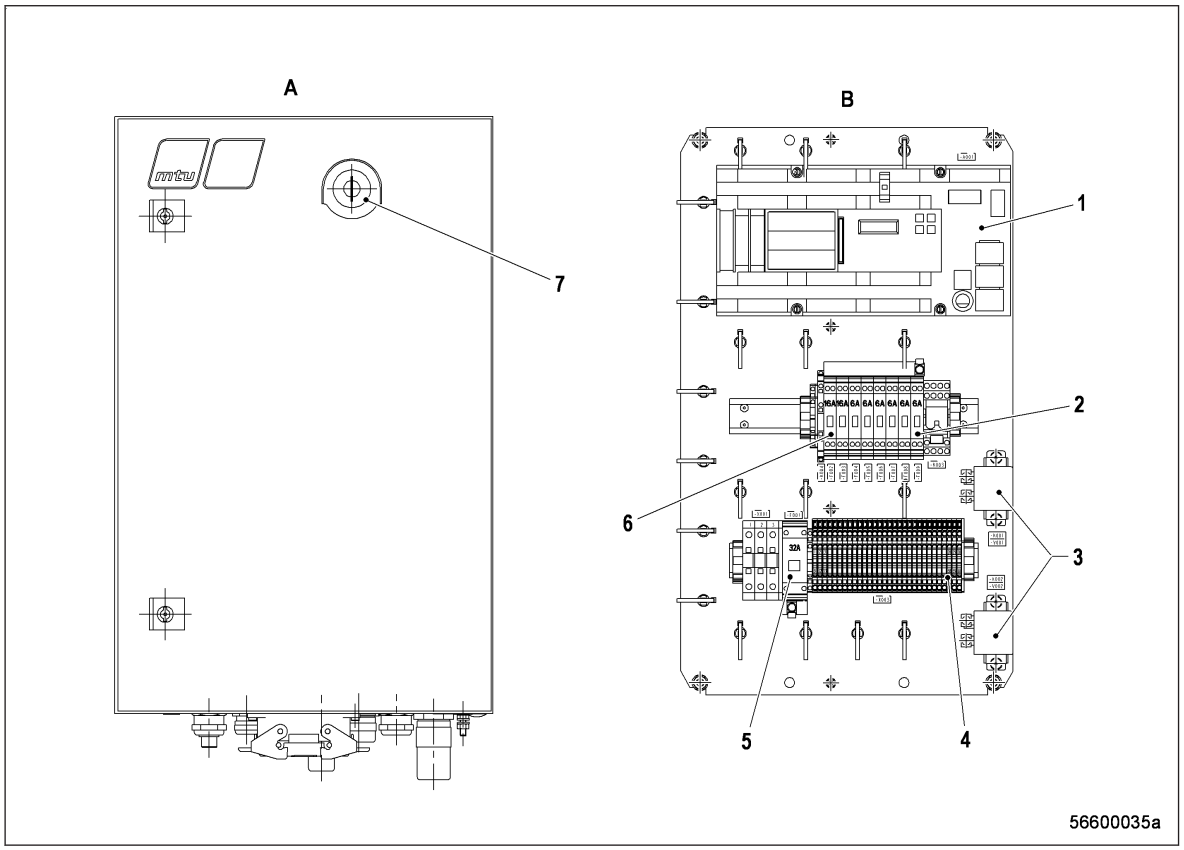
Mixture throttles ProAct

- The mixture throttles in the mixture lines which are controlled by the engine governor

TIM-ID: 0000017542 - 002

2.6.2 Control cabinet MIS – Overview

Phase 3 gas engine control cabinet MIS – Overview



A Control cabinet door, external side
B Mounting plate
1 SAM
2 Automatic cutout 6A
3 Relay
4 Terminal block
5 Automatic cutout 32A
6 Automatic cutout 16A
7 Emergency stop (key switch)

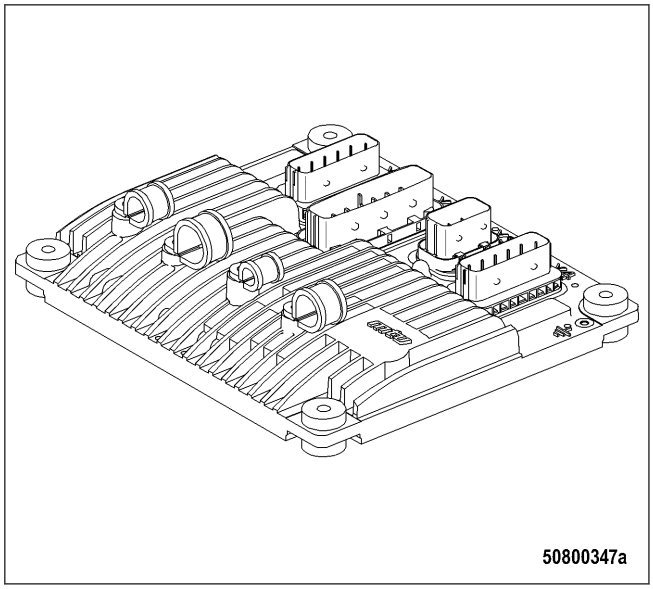
Fuses

F001	Starter A bank, starter B bank
F002	Throttle A bank, throttle B bank
F003	Ignition system
F004	Anti knock control AKR
F005	Emergency stop system
F006	TecJet50+
F007	SAM
F008	ADEC (ECU 7), EMU
F009	Bypass throttle

TIM-ID: 0000017700 - 001

2.6.3 Purpose of the units

Engine governor ADEC (ECU 7)



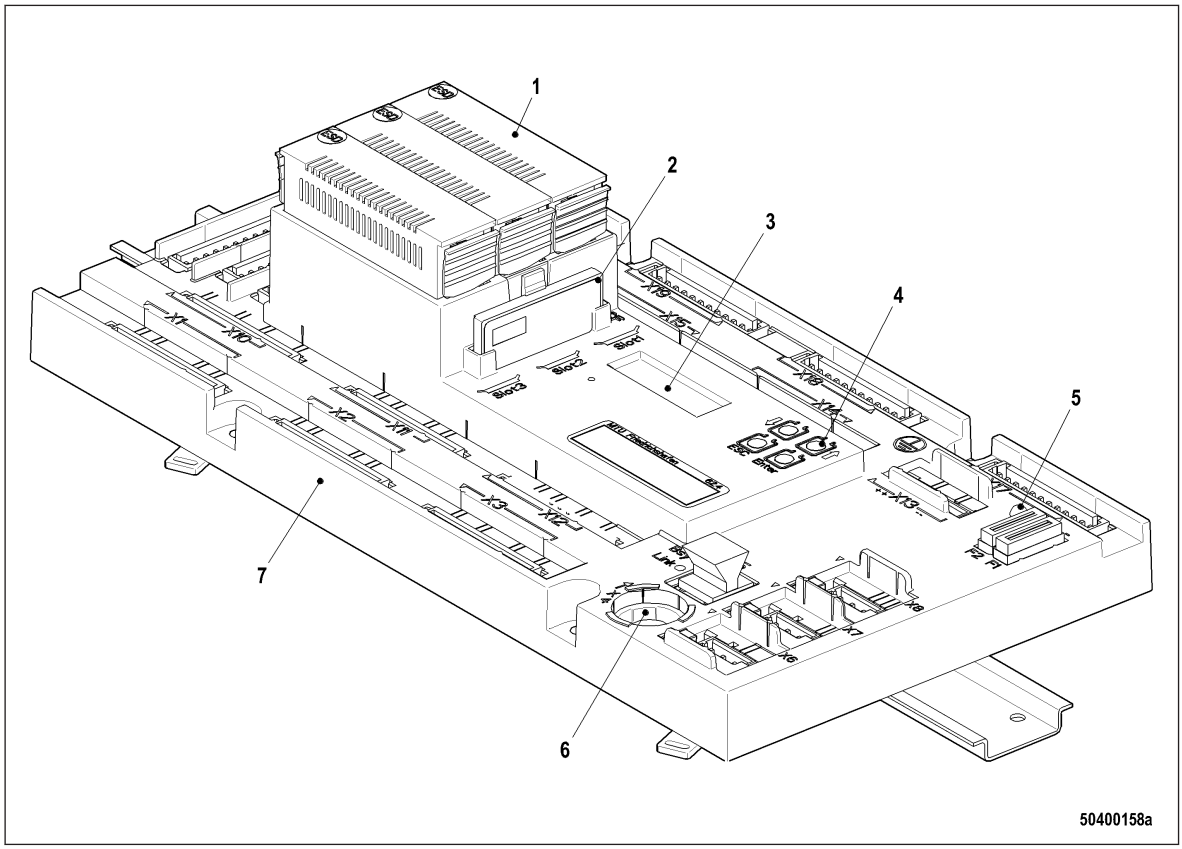
Central control and monitoring unit for the engine

- Communication with other devices and higher-level systems via CAN bus
- Control of throttles (mixture and gas)
- Acquisition and evaluation of engine operating states
- Limit value monitoring
- Self-monitoring and self-diagnostic functions
  - Integral status/fault display
  - Fault memory
- Large number of inputs/outputs provided:
  - Genset side: 14 inputs, 7 outputs, 2 serial interfaces,
  - Engine side: 39 inputs, 28 outputs, 1 serial interface
- Engine and genset-related parameter settings in flash memory
- In case of inadmissible states and limit value violations: Initiation of power reduction, engine stop or emergency engine stop (configurable)
- Diagnostic function via CAN interface (Default CAN1, connection for dialog unit provided)

Software structure:
- One data record for engine software
- One data record for genset software

TIM-ID: 0000017541 - 001

Service and Automation Module SAM



1 Module cassette, slots for additional I/O PIM cards
2 Compact Flash Memory card
3 Display for fault code and Mini Dialog
4 Control keys for Mini Dialog
5 Diagnostic lamp
6 Interface for dialog unit
7 Connector with spring design

SAM functions

- Display of fault codes from engine governor and SAM (3).
- Backup function, engine life data are stored
  - every hour,
  - after every engine stop
  - after every emergency engine stop.
- Interface for dialog unit.

Diagnosis

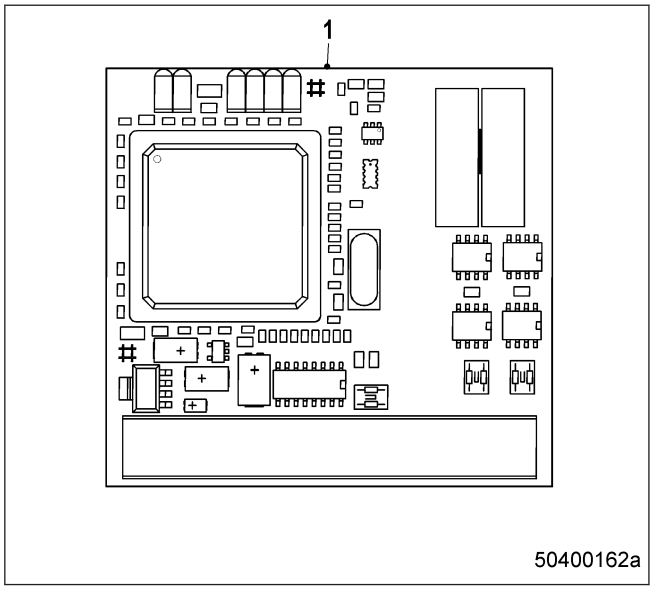
- Straightforward diagnosis by fault code display.
- Self-diagnosis by diagnostic lamp (5).
  - Steady = SAM is OK.
  - Flashing = SAM is faulty, contact Service.
  - Dark = Supply voltage missing.

TIM-ID: 0000017541 - 001

Customer interface

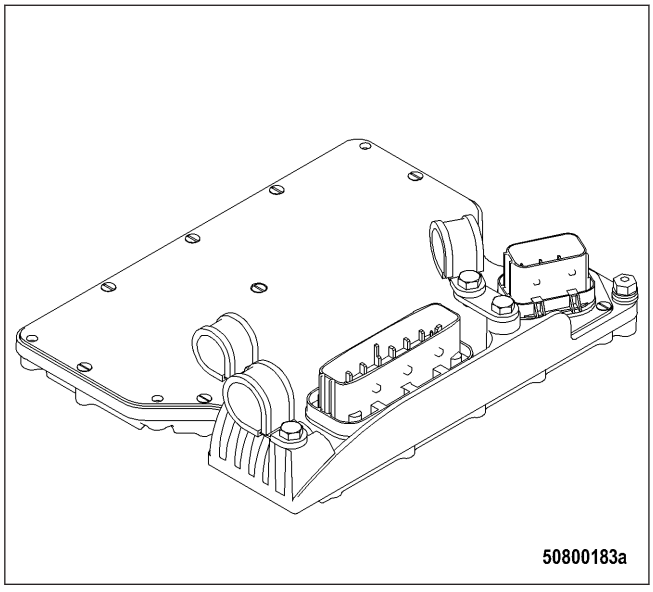
- 24 binary outputs
- 3 PWM outputs
- 8 display outputs
- 28 channel binary input
- 10 analog inputs (e.g. PT100, 4–20 mA, 0-10 V, etc.)
- 4 frequency inputs
- 1 dialog interface
- Extendable with MCS 5 PIM I/O cards

CANOpen and SAE-J1939 interface



For CANOpen and J1939 interface, a type CCB2 printed circuit board (1) is inserted in slot 3 of the SAM unit.

Engine Monitoring Unit EMU



EMU = Engine Monitoring Unit

TIM-ID: 0000017541 - 001

Monitoring unit for the engine

- Acquisition and processing of cylinder exhaust temperatures

Self-monitoring

TIM-ID: 0000017541 - 001

3 Operation

3.1 Putting the engine into operation after extended out-of-service-periods (>3 months)

Preconditions

☑ Engine is stopped and starting disabled.

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

Putting the engine into operation after extended out-of-service-periods (>3 months)

Item	Task
Engine	Depreserve (→ MTU Fluids and Lubricants Specifications A001061/..).
Engine	Bar engine manually (→ Page 133)
Valve drive	Out-of-service period ≥ 6 months: Grease valve drive (→ Page 144).
Lube oil system	Check engine oil level (→ Page 156); Checking oil level in oil storage tank (→ Page 156).
Coolant circuit	Out-of-service period more than 1 year: Change engine coolant (→ Page 161); Change mixture coolant (→ Page 167)
Coolant circuit	Check engine coolant level (→ Page 160); Check mixture coolant level (→ Page 166)
Engine wiring	Check plug connections (→ Page 170).
Gas supply	Open gas shut-off valve
Engine management system	Check for fault messages.
Battery	Check, fill with electrolyte (manufacturer's specifications).

TIM-ID: 0000010102 - 001

3.2 Putting the engine into operation after scheduled out-of-service-period

Preconditions

☑ Engine shut down and starting disabled.

Putting into operation

Item	Measure
Lube oil system	Check oil level in oil storage tank (→ Page 156).
Coolant circuit	Check engine coolant level (→ Page 160); Check mixture coolant level (→ Page 166)
Engine management system	Check for fault messages.

TIM-ID: 0000010660 - 002

3.3 Control, starting and stopping sequences

Starting and stopping sequences

The start sequence is software-controlled and depends on the place of start command input.

To ensure that no mixture is in the engine when ignition is switched on or off, which is a specific requirement for gas engines, special procedures for engine start / stop are specified.

Start sequence

If a start command is activated with the engine being at standstill, the following steps are carried out automatically:

1. (Optional) Prelubricating until the desired oil pressure is reached
2. Checking gas supply solenoid valves for leaks
3. Activating starter
4. Waiting for starting speed
5. Flushing the engine
6. Ignition
7. Opening gas supply solenoid valves
8. Waiting for starter disengagement speed
9. Disengaging starter
10. Waiting for idling speed
11. Runup to rated speed

Stop sequence

If a stop command is activated, the following steps are carried out automatically:

1. Closing gas supply solenoid valves
2. Coasting down engine to standstill or for a maximum coasting period
3. Deactivating ignition

Emergency stop sequence

If an emergency stop command is activated, the following steps are carried out automatically:

1. Closing gas supply solenoid valves and mixture throttles
2. Coasting down engine to standstill for a maximum coasting period
3. Deactivating ignition

Oil refill sequence

1. Waiting for engine running
2. Engine running for a minimum (parameterized) time period
3. Oil refilling enabled
4. When oil refill request is received
5. Refilling oil (automatically)
6. When oil refill request is canceled
7. Stopping oil refilling (automatically)

TIM-ID: 0000017305 - 002

3.4 Starting the engine

Preconditions

☑ Generator not connected to network

☑ Start interlock is not active.

DANGER

Unguarded rotating and moving engine components.
Risk of serious injury – danger to life!
- Before barring or starting the engine, make sure that nobody is in the danger zone.

WARNING

Engine noise above 85 dB (A).
Risk of damage to hearing!
- Wear ear protectors.

Engine starting (for control operations, see “Genset control system” documentation)

TIM-ID: 0000010119 - 003

3.5 Operational checks

DANGER

Unguarded rotating and moving engine components.
Risk of serious injury – danger to life!
- Take special care when working on a running engine.

WARNING

Engine noise above 85 dB (A).
Risk of damage to hearing!
- Wear ear protectors.

Operational checks

Item	Task
Machine room	Check machine room for smell of gas (→ Page 134).
Display SAM	Check for fault messages; If fault messages are displayed: Determine the cause, rectify the fault.
	Check indicated operating parameters (speed, temperatures, pressures)
Operation log (if provided)	Document operating parameters. • This is especially useful for fault localization and fast remedial action.
Engine under load, Engine at nominal speed	Check engine/plant and all pipework visually for leaks, rectify any leaks with the engine stopped; Check for abnormal running noises and vibration.

TIM-ID: 0000010134 - 001

3.6 Stopping the engine

Preconditions

☑ Generator is not connected to network.

CAUTION

Stopping the engine when it is running at full load causes extreme stress to the engine.
Risk of overheating, damage to components!

- Before stopping the engine, operate it at idle speed until operating temperatures decrease and stable values are indicated.

Stopping the engine (For control operations, refer to documentation “Genset control system”)

TIM-ID: 0000010152 - 002

3.7 Emergency stop

CAUTION

An emergency stop causes extreme stress to the engine.
Risk of overheating, damage to components!
- Initiate emergency stop only in emergency situations.

Emergency stop

Item	Task
Emergency stop button	Press. • Engine is stopped.

Safety measures

Item	Task
Emergency stop button	Remove key.

Rectifying cause

Item	Task
Engine control system	Determine cause for emergency stop and take remedial action; if the fault cannot be corrected, contact Service.

Prior to re-starting the engine

Item	Task
Emergency stop button (key switch)	Unlock.

TIM-ID: 0000010162 - 001

3.8 After stopping the engine – Engine remains ready for operation

After stopping the engine

Item	Measure
Engine / genset control system	• Engine is in stop mode. For engine restart, refer to documentation “Genset control system”.

TIM-ID: 0000010170 - 002

3.9 After stopping the engine – Putting the engine out of operation

Preconditions

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

After stopping the engine

Item	Task
Coolant system	Drain engine coolant (→ Page 162); Drain mixture coolant (→ Page 168) if: • freezing temperatures are expected and the engine is to remain out of service for an extended period, but coolant has no antifreeze additive; • the engine room is not heated; • the coolant is not maintained at a suitable temperature; • the antifreeze concentration is insufficient for the engine-room temperature; • antifreeze concentration is 50 % and engine-room temperature is below -40 °C.
Power supply to engine control system	Switch OFF.
Gas supply	Close gas shutoff valve.
Air intake and exhaust systems	If the engine is to remain out of service for more than 1 week, seal the engine's air and exhaust sides. If the engine is to remain out of operation for more than 1 month, preserve engine (→ MTU Fluids and Lubricants Specifications A001061/..).
Starter battery (batteries)	Charge regularly (trickle charge).
Control-voltage battery (batteries)	If fitted: Charge regularly (trickle charge).

TIM-ID: 0000002710 - 001

4 Maintenance

4.1 50-hours check

50-hours check

One-time operations to be carried out after the first 50 operating hours of the cylinder head (with a new engine, after installation of new cylinder heads, after component maintenance or extended component maintenance).

When installing a cylinder head with run-in mating faces (e.g. after piston replacement), a repeated check after the first 50 operating hours is not necessary.

Qualification	Interval [hours]	[years]	Item	Tasks	Task
QL1	-	-	Valve gear	Check valve clearance (→ Page 148)	-

TIM-ID: 0000002785 - 001

4.2 Maintenance task reference table [QL1]

The maintenance tasks and intervals for this product are defined in the Maintenance Schedule. The Maintenance Schedule is a stand-alone publication.

The task numbers in this table provide reference to the maintenance tasks specified in the Maintenance Schedule.

Task	Measures	
W0501	Visually inspect engine for leaks and general condition	(→ Page 41)
W0509	Check machine room for smell of gas	(→ Page 134)
W0523	Check for abnormal running noises and vibrations	–
W0527	Check engine oil level in storage tank	(→ Page 156)
W1002	Check valve clearance	(→ Page 148)
W1005	Replace air filter	(→ Page 154)
W1008	Replace engine oil filter at each oil change or when the time limit (years) is reached, at the latest	(→ Page 159)
W1046	Crankcase breather: Replace filter or filter element	(→ Page 135)
W1089	Check gas lines for leaks, seal if required	(→ Page 153)
W1091	Check ignition timing, readjust as necessary	(→ Page 137)
W1168	Replace spark plugs	(→ Page 142)
W1341	Check exhaust emissions, adjust if required	–
W1382	Replace vent line of engine coolant circuit (8/12/16V only)	(→ Page 165)
W1688	Replace spark plug connectors	(→ Page 138)
W1689	Measure valve depth	(→ Page 145)

Table 32: Maintenance task reference table [QL1]

TIM-ID: 0000035884 - 003

5 Troubleshooting

5.1 Fault indication on SAM display

General abbreviations used

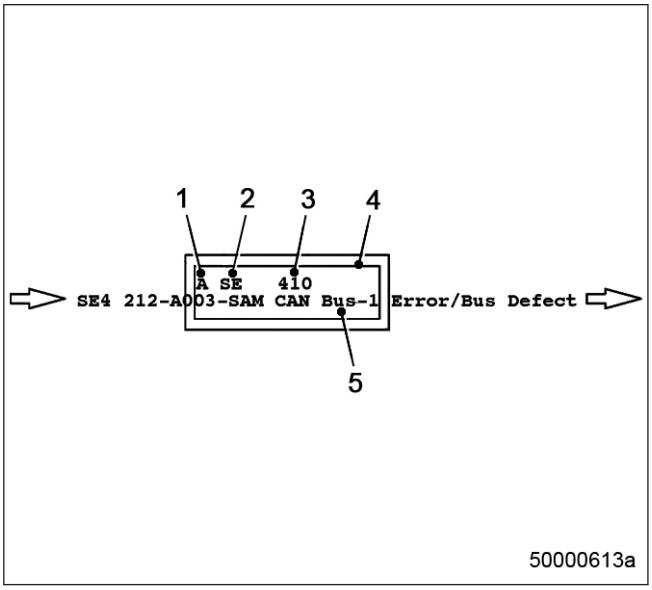
The following general abbreviations are used in the fault message texts:

Abbreviation	Meaning
DL <Number>	Default Lost: The device identified by <number> has no connection to the Default CAN bus.
RL <number>	Redundant Lost: The device identified by <number> has no connection to the Redundant CAN bus.
SD <sensor designation>	Sensor defect: The sensor identified by <sensor designation> does not provide an evaluable signal.
MD	Missing Data: A measuring point does not provide data.
AL	Alarm: Alarm message
SS	Safety System: The safety system responded in one of the specified ways.
TD	Transmitter Deviation: Two sensors which acquire the measured values of the same medium provide different measured values.
HI	High: The first limit value has been exceeded.
HIHI	High High: The second limit value has been exceeded.
LO	Low: The first limit value has not been attained.
LOLO	Low Low: The second limit value has not been attained.
MG	Message: General message
SE	System Error: Warning due to a node failure on the Default field bus.
PB	Push Button: Condition after activating certain control buttons.
AKR	AntiKlopfRegelung (Anti Knock Control GET)

Fault indication on SAM display

The fault messages are generated by the engine governor ADEC (ECU) and by the SAM unit and transmitted to the SAM display (4).

TIM-ID: 0000017545 - 001



The two lines (16-digit) on the alarm side have the following structure:

- 1st line: fault description
  The following information is given here:
  - Time window (1)
    The letter indicates when the fault occurred. It is updated automatically:
    - A: currently active alarm
    - B: within the last hour (active alarms switch to B immediately)
    - C: within the past 1-4 hours
    - D: within the past 4-12 hours
    - E: more than 12 hours ago
  - Fault type code (2)
    These two letters indicate the source of a fault:
    - SE
      Stands for System Error. The fault number (→ Page 50) and the number of the device that caused the fault indicated in the following.
      - ECU (ADEC) – 02
      - EMU – 03
      - SAM – 06
    - AL
      This is a fault message from the SAM. This code is always followed by a 6-digit number indicating the fault code from the SAM.
    - EC
      This is an alarm message from the engine governor. This code is always followed by a 3-digit number (3) indicating the fault code from the engine governor.
- 2nd line: plain text message that rolls if the text has more than 16 characters, providing more information about the faults currently displayed.

Proceed to the next alarm by pressing key (↓ ↑).

TIM-ID: 0000017545 - 001

Important information about fault messages from the SAM

Fault messages from the SAM are represented in the fault code list (→ Page 52).

Only persons with a corresponding qualification/training at MTU are allowed to carry out the measures listed below.

Contact Service should troubleshooting as prescribed in the fault code list prove unsuccessful.

Important information about fault messages from the engine governor

Fault messages from the engine governor are represented in the fault code list (→ Page 102).

Information pertaining to alarm colors and automatic engine shutdown in the fault code list refer to the (default) factory settings of the engine governor on delivery. Different system response may be possible due to changes to the genset control system made by the OEM (see documentation of the genset manufacturer).

Only persons with a corresponding qualification/training at MTU are allowed to carry out the measures listed below.

Contact Service should troubleshooting as prescribed in the fault code list prove unsuccessful.

Recommended action in case of alarm

Yellow alarm:

The engine can still be operated providing that automatic engine shutdown to protect the engine has not been configured or is not tripped. Contact Service immediately/start fault rectification.

Red alarm:

Caution, the engine is running at its limits. Shut down manually without further delay if the engine does not shut itself down immediately after a red alarm is signaled.

SE (System Error) alarms

SE No.	Fault message text
0	Sensor Temperature Defect
1	Temperature failure
2	Sensor Voltage Defect
3	Voltage failure
4	CAN Bus- 1 Error/Bus Defec
5	CAN Bus- 1 Overrun
6	CAN Bus- 2 Error/Bus Defec
7	CAN Bus- 2 Overrun
8	Temperature Compensation Error
9	I/O-Module Slot2 Defect
10	I/O-Module Slot3 Defect
11	I/O-Module Slot4 Defect
12	Serial Connection Lost
13	CAN Bus- 3 Error/Bus Defec
14	CAN Bus- 3 Overrun
15	S/A Bus Faulty
16	PAN 1 Defect
17	PAN 2 Defect
18	PAN 3 Defect
19	PAN 4 Defect
20	PAN 5 Defect
21	PAN 6 Defect
22	I/O-Module Slot1 Defect
23	I/O-Module Slot5 Defect
24	I/O-Module Slot6 Defect
25	I/O-Module Slot7 Defect

TIM-ID: 0000017545 - 001

SE No.	Fault message text
26	I/O-Module Slot8 Defect
27	Download Server Collision
28	not projected node
29	Device specific error
30	not projected node
31	Device specific error

TIM-ID: 0000017545 - 001

5.2 SAM – Fault messages

112222 – HI T-Exhaust Mean

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The average value of all individual cylinder exhaust temperatures is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112223 – HIHI T-Exhaust Mean

Red alarm. Initiated by EMU.

Cause	Corrective action
The average value of all individual cylinder exhaust temperatures is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112301 – HI T-Exhaust A1

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112302 – HI T-Exhaust A2

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112303 – HI T-Exhaust A3

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112304 – HI T-Exhaust A4

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112305 – HI T-Exhaust A5

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112306 – HI T-Exhaust A6

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112307 – HI T-Exhaust A7

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112308 – HI T-Exhaust A8

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112309 – HI T-Exhaust A9

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112310 – HI T-Exhaust A10

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112311 – HI T-Exhaust B1

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112312 – HI T-Exhaust B2

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112313 – HI T-Exhaust B3

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112314 – HI T-Exhaust B4

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112315 – HI T-Exhaust B5

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112316 – HI T-Exhaust B6

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112317 – HI T-Exhaust B7

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112318 – HI T-Exhaust B8

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112319 – HI T-Exhaust B9

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112320 – HI T-Exhaust B10

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112401 – LO T-Exhaust A1

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112402 – LO T-Exhaust A2

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112403 – LO T-Exhaust A3

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112404 – LO T-Exhaust A4

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112405 – LO T-Exhaust A5

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112406 – LO T-Exhaust A6

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112407 – LO T-Exhaust A7

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112408 – LO T-Exhaust A8

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112409 – LO T-Exhaust A9

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112410 – LO T-Exhaust A10

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112411 – LO T-Exhaust B1

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112412 – LO T-Exhaust B2

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112413 – LO T-Exhaust B3

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112414 – LO T-Exhaust B4

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112415 – LO T-Exhaust B5

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112416 – LO T-Exhaust B6

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112417 – LO T-Exhaust B7

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112418 – LO T-Exhaust B8

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112419 – LO T-Exhaust B9

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112420 – LO T-Exhaust B10

Yellow alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112501 – HIHI T-Exhaust A1

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112502 – HIHI T-Exhaust A2

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112503 – HIHI T-Exhaust A3

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112504 – HIHI T-Exhaust A4

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112505 – HIHI T-Exhaust A5

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112506 – HIHI T-Exhaust A6

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112507 – HIHI T-Exhaust A7

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112508 – HIHI T-Exhaust A8

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112509 – HIHI T-Exhaust A9

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112510 – HIHI T-Exhaust A10

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112511 – HIHI T-Exhaust B1

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112512 – HIHI T-Exhaust B2

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112513 – HIHI T-Exhaust B3

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112514 – HIHI T-Exhaust B4

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112515 – HIHI T-Exhaust B5

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112516 – HIHI T-Exhaust B6

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112517 – HIHI T-Exhaust B7

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112518 – HIHI T-Exhaust B8

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112519 – HIHI T-Exhaust B9

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112520 – HIHI T-Exhaust B10

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high as compared with the average value.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112601 – LOLO T-Exhaust A1

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112602 – LOLO T-Exhaust A2

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112603 – LOLO T-Exhaust A3

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112604 – LOLO T-Exhaust A4

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112605 – LOLO T-Exhaust A5

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112606 – LOLO T-Exhaust A6

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112607 – LOLO T-Exhaust A7

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112608 – LOLO T-Exhaust A8

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112609 – LOLO T-Exhaust A9

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112610 – LOLO T-Exhaust A10

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112611 – LOLO T-Exhaust B1

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112612 – LOLO T-Exhaust B2

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112613 – LOLO T-Exhaust B3

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112614 – LOLO T-Exhaust B4

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112615 – LOLO T-Exhaust B5

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112616 – LOLO T-Exhaust B6

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

TIM-ID: 0000017543 - 001

112617 – LOLO T-Exhaust B7

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112618 – LOLO T-Exhaust B8

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112619 – LOLO T-Exhaust B9

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112620 – LOLO T-Exhaust B10

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too low as compared with the average value.	1. Check spark plug. 2. Check emission values. 3. Check ignition timing (→ Page 137). 4. Check valve drive.

112701 – HIHI T-Exhaust A1 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112702 – HIHI T-Exhaust A2 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112703 – HIHI T-Exhaust A3 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112704 – HIHI T-Exhaust A4 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112705 – HIHI T-Exhaust A5 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112706 – HIHI T-Exhaust A6 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112707 – HIHI T-Exhaust A7 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112708 – HIHI T-Exhaust A8 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112709 – HIHI T-Exhaust A9 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112710 – HIHI T-Exhaust A10 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112711 – HIHI T-Exhaust B1 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112712 – HIHI T-Exhaust B2 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112713 – HIHI T-Exhaust B3 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112714 – HIHI T-Exhaust B4 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112715 – HIHI T-Exhaust B5 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112716 – HIHI T-Exhaust B6 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112717 – HIHI T-Exhaust B7 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112718 – HIHI T-Exhaust B8 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112719 – HIHI T-Exhaust B9 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

112720 – HIHI T-Exhaust B10 (abs)

Red alarm. Initiated by EMU.

Cause	Corrective action
The exhaust temperature of this cylinder is too high.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check valve drive (exhaust valves do not close).

TIM-ID: 0000017543 - 001

112923 – MD/SD T-Exhaust

Red alarm. Initiated by EMU.

Cause	Corrective action
Combined alarm (for details, refer to the source alarm).	▶ Combined alarm (for details, refer to the source alarm).

150176 – Lube Oil Min

Red alarm. Initiated by SAM.

Cause	Corrective action
Minimum engine oil level detected.	1. Check engine oil level (→ Page 156). 2. Check replenishment system (→ Page 156).

150178 – Lube Oil Max

Red alarm. Initiated by SAM.

Cause	Corrective action
Maximum engine oil level detected.	1. Check engine oil level (→ Page 156). 2. Check replenishment system (→ Page 156).

150200 – Communication Lost ECU

Red alarm. Initiated by SAM.

Cause	Corrective action
No communication with ECU CAN.	1. Check supply voltage. 2. Check connecting line.

150201 – Communication Lost EMU

Red alarm. Initiated by SAM.

Cause	Corrective action
No communication with EMU CAN.	1. Check supply voltage. 2. Check connecting line.

150202 – Comm. Lost Knock Module

Red alarm. Initiated by SAM.

Cause	Corrective action
No communication with knocking module CAN.	1. Check supply voltage. 2. Check connecting line.

150203 – Comm. Lost Ignition

Red alarm. Initiated by SAM.

Cause	Corrective action
No communication with ignition CAN.	1. Check supply voltage. 2. Check connecting line.

TIM-ID: 0000017543 - 001

150204 – Comm. Lost Mixer (TecJet)

Red alarm. Initiated by SAM.

Cause	Corrective action
No communication with mixer (TecJet) CAN.	1. Check supply voltage. 2. Check connecting line.

150352 – SS Release Circuit Breaker

Red alarm. Initiated by SAM.

Cause	Corrective action
Circuit breaker release detected.	▶ Check circuit breakers.

150358 – HI Lube Oil Level refill

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Engine oil was refilled too often within a certain time interval.	1. Check engine oil level (→ Page 156). 2. Check oil supply (→ Page 156).

150365 – SS Gas Pressure MIN

Red alarm. Initiated by SAM.

Cause	Corrective action
Minimum gas pressure applied.	1. Check initial gas pressure and gas line. 2. Check cabling.

150399 – SS Coolant too Low

Red alarm. Initiated by SAM.

Cause	Corrective action
Lack of coolant in cooling system, feedback signal from level sensor missing.	1. Check sensor and cabling, replace as necessary. 2. Check coolant level. 3. Pinpoint leakage.

150400 – AL Preheating Error

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Preheating fault, coolant differential pressure over engine is below the specified value.	1. Check differential coolant pressure. 2. Check operation of coolant pumps.

150401 – HI Oil Refill

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Too many pulses received for lube oil replenishment.	1. Check engine oil level (→ Page 156). 2. Check oil supply (→ Page 156).

TIM-ID: 0000017543 - 001

150402 – LO Oil Refill

Yellow alarm. Initiated by SAM.

Cause	Corrective action
No oil replenishment within a configurable time.	▶ Check oil replenishment system.

150403 – AL Oil Refill Error

Red alarm. Initiated by SAM.

Cause	Corrective action
After initiation of the alarms “HI Oil Refill” and “HI Lube Oil Level refill” a configurable time-out period starts. When this time-out period is expired, the engine is stopped.	1. Check engine oil level (→ Page 156). 2. Check oil supply (→ Page 156).

150410 – MD/SD MesPower

Red alarm. Initiated by SAM.

Cause	Corrective action
Actual power signal out of valid range.	1. Check cabling. 2. Check signal.

150504 – LO Engine Power

Yellow alarm. Initiated by SAM.

Cause	Corrective action
The engine is running below minimum load.	▶ Check power setpoint signal.

150601 – AL Gas Valve 1 feedback

Red alarm. Initiated by SAM.

Cause	Corrective action
Feedback signal from valve 1 does not correspond with setpoint signal.	▶ Check valve 1 and cabling.

150902 – SS Local Initiated Emerg. Stop

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop detected. Emergency stop was released manually (button), or ignition system reported overspeed.	▶

TIM-ID: 0000017543 - 001

151021 – Warning Hold Position

Yellow alarm. Initiated by TecJet.

Cause	Corrective action
Hold position is activated.	▶ Deactivate setting or interrupt serial communication.

151022 – Zero Pressure Detected

Yellow alarm. Initiated by TecJet.

Cause	Corrective action
No gas pressure/gas flow detected.	▶ Check gas pressure.

151023 – Zero Flow Detected

Yellow alarm. Initiated by TecJet.

Cause	Corrective action
No gas pressure/gas flow detected.	▶ Check gas pressure.

151024 – Flow Not Reached

Red alarm. Initiated by TecJet.

Cause	Corrective action
No gas flow detected.	1. Check inlet and outlet. 2. Check gas pressure, gas quality, gas filter, gas line for obstruction. 3. Check engine for overloading.

151025 – Valve Position Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151026 – High Elec Temp

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151028 – Elec Temp Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

TIM-ID: 0000017543 - 001

151029 – FGT Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151030 – Delta P Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Excessive differential pressure over TecJet detected.	1. Check gas pressure. 2. Check TecJet for dirt.

151031 – FGP Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151032 – Coil Current Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151035 – Position Fail High

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151036 – Elec Temp Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151037 – FGT Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Gas temperature before TecJet is below the preset limit value.	▶ Check TecJet and configuration.

TIM-ID: 0000017543 - 001

151038 – Delta P Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Differential pressure at TecJet is below the preset limit value.	▶ Check TecJet and configuration.

151039 – FGP Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Gas pressure before TecJet is below the preset limit value.	▶ Check TecJet and configuration.

151040 – Coil Current Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151043 – Position Fail Low

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151048 – Analog Input Low Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
TecJet setting is not correct.	▶ Check setting and switch over to PWM input. Check PWM signal.

151049 – Analog Input High Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
TecJet setting is not correct.	▶ Check setting and switch over to PWM input. Check PWM signal.

151050 – PWM Duty Cycle Low Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
PWM signal is beyond the valid range.	1. Check cabling. 2. Check frequency. 3. Check signal.

TIM-ID: 0000017543 - 001

151051 – PWM Duty Cycle High Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
PWM signal is beyond the valid range.	1. Check cabling. 2. Check frequency. 3. Check signal.

151052 – Battery Volt Low Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Supply voltage has reached minimum limit value.	1. Check supply voltage. 2. Check cabling.

151053 – FGT Low Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151054 – Delta P Low Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151055 – FGP Low Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Configured limit value was not attained.	▶ Check position direction of TecJet.

151056 – Battery Volt High Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Supply voltage has reached maximum limit value.	1. Check supply voltage. 2. Check cabling.

151057 – FGT High Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

TIM-ID: 0000017543 - 001

151058 – Delta P High Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151059 – FGP High Limit Error

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151061 – Watchdog Reset

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151064 – CAN Flow Demand Failed

Red alarm. Initiated by TecJet.

Cause	Corrective action
TecJet setting is not correct.	▶ Switch over setting to PWM input. Check PWM signal.

151066 – TecJet Shutdown

Red alarm. Initiated by TecJet.

Cause	Corrective action
TecJet combined alarm. At least one additional TecJet alarm is pending.	▶ Rectify the cause of the source alarm.

151067 – TecJet Internal Fault

Red alarm. Initiated by TecJet.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart TecJet.

151069 – Keyswitch State

Red alarm. Initiated by TecJet.

Cause	Corrective action
Keyswitch cabling missing.	▶ Check cabling.

TIM-ID: 0000017543 - 001

152011 – Error Missing Ring Gear Signal

Red alarm. Initiated by IC922.

Cause	Corrective action
Crankshaft signal for ignition speed 182 teeth missing.	▶ Check sensor B13.2, check sensor clearance and cabling, replace if necessary. Restart of ignition system required to restart the engine.

152012 – Error Missing Reset Signal

Red alarm. Initiated by IC922.

Cause	Corrective action
Reset signal from crankshaft is missing.	▶ Check sensor B75, check sensor clearance and cabling, replace if necessary. Restart of ignition system required to restart the engine.

152013 – Error Missing Camshaft Signal

Red alarm. Initiated by IC922.

Cause	Corrective action
Camshaft signal for ignition is missing.	▶ Check sensor B1.2, check sensor clearance and cabling, replace if necessary. Restart of ignition system required to restart the engine.

152014 – Error Number of Teeth

Red alarm. Initiated by IC922.

Cause	Corrective action
Incorrect number of teeth on timing wheel detected.	1. Check timing wheel. 2. Check settings.

152015 – Unknown Engine Appl. Code

Red alarm. Initiated by IC922.

Cause	Corrective action
Ignition setting is not correct.	▶ Check setting.

152016 – OverSpeed Shutdown

Red alarm. Initiated by IC922.

Cause	Corrective action
Genset has exceeded admissible speed.	▶ Restart ignition system.

152018 – E2PROM Checksum Error

Red alarm. Initiated by IC922.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart ignition system.

TIM-ID: 0000017543 - 001

152019 – Global Timing out of Range

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Specified global ignition timing is beyond the valid range.	▶ Adjust value.

152020 – Unknown Timing or Energy Level

Red alarm. Initiated by IC922.

Cause	Corrective action
No global ignition timing and power level received, CAN bus connection is faulty.	▶ Check cabling and setting.

152021 – Individual Timing out of Range

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Specified individual ignition timing is beyond the valid range.	▶ Adjust value.

152023 – Selftest Shutdown

Cause	Corrective action
Self-test is active with the engine rotating.	▶ Restart ignition system.

152024 – Open Primary Rate Exceeded

Red alarm. Initiated by IC922.

Cause	Corrective action
Admissible summation of discharge faults is reached.	1. Check associated cabling. 2. Check ignition coils.

152026 – Open Primary, Channel 1

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152027 – Open Primary, Channel 2

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

TIM-ID: 0000017543 - 001

152028 – Open Primary, Channel 3

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152029 – Open Primary, Channel 4

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152030 – Open Primary, Channel 5

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152031 – Open Primary, Channel 6

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152032 – Open Primary, Channel 7

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152033 – Open Primary, Channel 8

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152034 – Open Primary, Channel 9

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

TIM-ID: 0000017543 - 001

152035 – Open Primary, Channel 10

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152036 – Open Primary, Channel 11

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152037 – Open Primary, Channel 12

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152038 – Open Primary, Channel 13

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152039 – Open Primary, Channel 14

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152040 – Open Primary, Channel 15

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152041 – Open Primary, Channel 16

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

TIM-ID: 0000017543 - 001

152042 – Open Primary, Channel 17

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152043 – Open Primary, Channel 18

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152044 – Open Primary, Channel 19

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152045 – Open Primary, Channel 20

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Ignition energy was not discharged.	1. Check cabling to ignition coil. 2. Check ignition coil.

152050 – Warn. Missing Ring Gear Signal

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Crankshaft signal 182 teeth is missing.	▶ Check sensor B13.2, check sensor clearance and cabling, replace if necessary.

152051 – Warning Missing Reset Signal

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Reset signal from crankshaft is missing.	▶ Check sensor B75, check sensor clearance and cabling, replace if necessary.

152052 – Warn. Missing Camshaft Signal

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Missing camshaft signal for ignition system.	▶ Check sensor B1.2, check sensor clearance and cabling, replace if necessary.

TIM-ID: 0000017543 - 001

152054 – SCR Fault Odd

Red alarm. Initiated by IC922.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart ignition system.

152055 – SCR Fault Even

Red alarm. Initiated by IC922.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart ignition system.

152056 – Odd Energy Level out of Range

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Specified energy level is beyond the valid range.	▶ Adjust value.

152057 – Even Energy Level out of Range

Yellow alarm. Initiated by IC922.

Cause	Corrective action
Specified energy level is beyond the valid range.	▶ Adjust value.

153101 – Error Status

Red alarm. Initiated by antiknock control.

Cause	Corrective action
AKR combined alarm. At least one additional AKR alarm is pending.	▶ Rectify the cause of the source alarm.

153102 – Combined Error

Red alarm. Initiated by antiknock control.

Cause	Corrective action
Combined alarm (for details, refer to the source alarm).	▶ Combined alarm (for details, refer to the source alarm).

153103 – Internal Error

Red alarm. Initiated by antiknock control.

Cause	Corrective action
Hardware not ready for operation.	▶ Restart antiknock control system.

TIM-ID: 0000017543 - 001

153104 – Error Camshaft

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal from camshaft sensor for antiknock control.	1. Check cabling. 2. Check sensor B1.3, replace as necessary.

153111 – Knock Sensor Error A1

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153112 – Knock Sensor Error A2

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153113 – Knock Sensor Error A3

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153114 – Knock Sensor Error A4

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153115 – Knock Sensor Error A5

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

TIM-ID: 0000017543 - 001

153116 – Knock Sensor Error A6

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153117 – Knock Sensor Error A7

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153118 – Knock Sensor Error A8

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153119 – Knock Sensor Error A9

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153120 – Knock Sensor Error A10

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153121 – Knock Sensor Error B1

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

TIM-ID: 0000017543 - 001

153122 – Knock Sensor Error B2

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153123 – Knock Sensor Error B3

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153124 – Knock Sensor Error B4

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153125 – Knock Sensor Error B5

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153126 – Knock Sensor Error B6

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153127 – Knock Sensor Error B7

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

TIM-ID: 0000017543 - 001

153128 – Knock Sensor Error B8

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153129 – Knock Sensor Error B9

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153130 – Knock Sensor Error B10

Red alarm. Initiated by antiknock control.

Cause	Corrective action
No signal received from this knock sensor.	1. Check cabling. 2. Check sensor (tightening torque, damage), replace as necessary.

153221 – HI Knock Integrator A1

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153222 – HI Knock Integrator A2

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153223 – HI Knock Integrator A3

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153224 – HI Knock Integrator A4

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153225 – HI Knock Integrator A5

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153226 – HI Knock Integrator A6

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153227 – HI Knock Integrator A7

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153228 – HI Knock Integrator A8

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153229 – HI Knock Integrator A9

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153230 – HI Knock Integrator A10

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153231 – HI Knock Integrator B1

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153232 – HI Knock Integrator B2

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153233 – HI Knock Integrator B3

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153234 – HI Knock Integrator B4

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153235 – HI Knock Integrator B5

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153236 – HI Knock Integrator B6

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153237 – HI Knock Integrator B7

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153238 – HI Knock Integrator B8

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153239 – HI Knock Integrator B9

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153240 – HI Knock Integrator B10

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Readjustment of ignition timing beyond a limit value because knocking was detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153241 – HIHI Knock Integrator A1

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153242 – HIHI Knock Integrator A2

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153243 – HIHI Knock Integrator A3

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153244 – HIHI Knock Integrator A4

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153245 – HIHI Knock Integrator A5

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153246 – HIHI Knock Integrator A6

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153247 – HIHI Knock Integrator A7

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153248 – HIHI Knock Integrator A8

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153249 – HIHI Knock Integrator A9

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153250 – HIHI Knock Integrator A10

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153251 – HIHI Knock Integrator B1

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153252 – HIHI Knock Integrator B2

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153253 – HIHI Knock Integrator B3

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153254 – HIHI Knock Integrator B4

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153255 – HIHI Knock Integrator B5

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153256 – HIHI Knock Integrator B6

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153257 – HIHI Knock Integrator B7

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153258 – HIHI Knock Integrator B8

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

TIM-ID: 0000017543 - 001

153259 – HIHI Knock Integrator B9

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153260 – HIHI Knock Integrator B10

Red alarm. Initiated by SAM.

Cause	Corrective action
Emergency stop due to knocking detected in this cylinder.	1. Check emission values. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

153261 – HI Misfire Integrator A1

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153262 – HI Misfire Integrator A2

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153263 – HI Misfire Integrator A3

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153264 – HI Misfire Integrator A4

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153265 – HI Misfire Integrator A5

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153266 – HI Misfire Integrator A6

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153267 – HI Misfire Integrator A7

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153268 – HI Misfire Integrator A8

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153269 – HI Misfire Integrator A9

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153270 – HI Misfire Integrator A10

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153271 – HI Misfire Integrator B1

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153272 – HI Misfire Integrator B2

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153273 – HI Misfire Integrator B3

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153274 – HI Misfire Integrator B4

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153275 – HI Misfire Integrator B5

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153276 – HI Misfire Integrator B6

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153277 – HI Misfire Integrator B7

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153278 – HI Misfire Integrator B8

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153279 – HI Misfire Integrator B9

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153280 – HI Misfire Integrator B10

Yellow alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153281 – HIHI Misfire Integrator A1

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153282 – HIHI Misfire Integrator A2

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153283 – HIHI Misfire Integrator A3

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153284 – HIHI Misfire Integrator A4

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153285 – HIHI Misfire Integrator A5

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153286 – HIHI Misfire Integrator A6

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153287 – HIHI Misfire Integrator A7

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153288 – HIHI Misfire Integrator A8

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153289 – HIHI Misfire Integrator A9

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153290 – HIHI Misfire Integrator A10

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153291 – HIHI Misfire Integrator B1

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153292 – HIHI Misfire Integrator B2

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153293 – HIHI Misfire Integrator B3

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153294 – HIHI Misfire Integrator B4

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153295 – HIHI Misfire Integrator B5

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153296 – HIHI Misfire Integrator B6

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153297 – HIHI Misfire Integrator B7

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153298 – HIHI Misfire Integrator B8

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

153299 – HIHI Misfire Integrator B9

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

153300 – HIHI Misfire Integrator B10

Red alarm. Initiated by SAM.

Cause	Corrective action
Misfiring was detected in this cylinder.	1. Check emission values. 2. Check spark plug (energy level ignition system).

TIM-ID: 0000017543 - 001

5.3 Engine governor – Fault messages

015 – LO P-Lube Oil

ZKP-Number:

Yellow alarm.

Associated parameter 2.0100.921

Cause	Corrective action
Engine oil pressure too low (limit value 1). Lack of engine oil, engine speed too low, oil lines, oil heat exchanger clogged, oil pump defective.	1. Check oil system, oil heat exchanger. 2. Replace oil filter (→ Page 159). 3. Take oil sample and analyze (→ Page 158).

016 – SS P-Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0100.922

Cause	Corrective action
Engine oil pressure too low (limit value 2). Lack of engine oil, engine speed too low, oil lines, oil heat exchanger clogged, oil pump defective.	1. Check oil system, oil heat exchanger. 2. Replace oil filter (→ Page 159). 3. Take oil sample and analyze (→ Page 158).

019 – HI T-Exhaust A

ZKP-Number:

Yellow alarm.

Associated parameter 2.0126.931

Cause	Corrective action
Exhaust gas temperature (A side) after turbine too high (limit value 1). Incorrect ignition timing, mixture too lean or too rich, damage to turbine.	1. Check exhaust turbocharger. 2. Check ignition timing (→ Page 137). 3. Check mixture setting. 4. Check spark plugs.

TIM-ID: 0000017544 - 001

020 – SS T-Exhaust A

ZKP-Number:

Yellow alarm.

Associated parameter 2.0126.932

Cause	Corrective action
Exhaust gas temperature (A side) after turbine too high (limit value 2). Incorrect ignition timing, mixture too lean or too rich, damage to turbine.	1. Check exhaust turbocharger. 2. Check ignition timing (→ Page 137). 3. Check mixture setting. 4. Check spark plugs.

021 – HI T-Exhaust B

ZKP-Number:

Yellow alarm.

Associated parameter 2.0127.931

Cause	Corrective action
Exhaust gas temperature (B side) after turbine too high (limit value 1). Incorrect ignition timing, mixture too lean or too rich, damage to turbine.	1. Check exhaust turbocharger. 2. Check ignition timing (→ Page 137). 3. Check mixture setting. 4. Check spark plugs.

022 – SS T-Exhaust B

ZKP-Number:

Yellow alarm.

Associated parameter 2.0127.932

Cause	Corrective action
Exhaust gas temperature (B side) after turbine too high (limit value 2). Incorrect ignition timing, mixture too lean or too rich, damage to turbine.	1. Check exhaust turbocharger. 2. Check ignition timing (→ Page 137). 3. Check mixture setting. 4. Check spark plugs.

025 – HI P-Diff-Lube Oil

ZKP-Number:

Yellow alarm.

Associated parameter 2.0154.931

Cause	Corrective action
Pressure loss via oil filter too high (limit value 1).	1. Replace oil filter (→ Page 159). 2. If this fault message occurs again after unexpectedly short filter runtime, check oil filter for deposits, change oil if required (→ Page 157).

TIM-ID: 0000017544 - 001

026 – HI P-Diff-Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0154.932

Cause	Corrective action
Pressure loss via oil filter too high (limit value 2).	1. Replace oil filter (→ Page 159). 2. If this fault message occurs again after unexpectedly short filter runtime, check oil filter for deposits, change oil if required (→ Page 157).

030 – SS Engine Overspeed

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.2510.932

Cause	Corrective action
Engine overspeed (limit value 2). This usually fault message usually follows other fault messages.	1. Check governor. 2. Check throttle closing position.

031 – HI ETC1 Overspeed

ZKP-Number:

Yellow alarm.

Associated parameter 2.3011.931

Cause	Corrective action
Speed of primary turbocharger too high (limit value 1).	▶ Turbocharger speed sensor is not fitted at present. Check ECU setting for this input.

032 – SS ETC1 Overspeed

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.3012.932

Cause	Corrective action
Speed of primary turbocharger too high (limit value 2).	▶ Turbocharger speed sensor is not fitted at present. Check ECU setting for this input.

TIM-ID: 0000017544 - 001

036 – HI ETC2 Overspeed

ZKP-Number:

Yellow alarm.

Associated parameter 2.3013.931

Cause	Corrective action
Speed of 1st secondary turbocharger too high (limit value 1).	▶ Turbocharger speed sensor is not fitted at present. Check ECU setting for this input.

037 – SS ETC2 Overspeed

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.3013.912

Cause	Corrective action
Speed of 1st secondary turbocharger too high (limit value 2).	▶ Turbocharger speed sensor is not fitted at present. Check ECU setting for this input.

051 – HI T-Lube Oil

ZKP-Number:

Yellow alarm.

Associated parameter 2.0125.931

Cause	Corrective action
Engine oil temperature after oil heat exchanger too high (limit value 1). Oil heat exchanger clogged, coolant temperature too high, oil flow too low.	1. Check engine coolant circuit. 2. Check oil heat exchanger. 3. Check oil level (→ Page 156).

052 – SS T-Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0125.932

Cause	Corrective action
Engine oil temperature after oil heat exchanger too high (limit value 2). Oil heat exchanger clogged, coolant temperature too high, oil flow too low.	1. Check engine coolant circuit. 2. Check oil heat exchanger. 3. Check oil level (→ Page 156).

TIM-ID: 0000017544 - 001

053 – HI T-Intake Air

ZKP-Number:

Yellow alarm.

Associated parameter 2.0123.931

Cause	Corrective action
Intake air temperature too high (limit value 1).	▶ Check ventilation system.

054 – HIHI T-Intake Air

ZKP-Number:

Yellow alarm.

Associated parameter 2.0123.932

Cause	Corrective action
Intake air temperature too high (limit value 2).	1. Check ventilation system. 2. Reduce power.

057 – LO P-Coolant

ZKP-Number:

Yellow alarm.

Associated parameter 2.0101.921

Cause	Corrective action
Coolant pressure after engine too low (limit value 1). Volumetric flow too low, static pressure too low.	▶ Check engine coolant circuit (pressure and volumetric flow).

058 – SS P-Coolant

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0101.922

Cause	Corrective action
Coolant pressure after engine too low (limit value 2). Volumetric flow too low, static pressure too low.	▶ Check engine coolant circuit (pressure and volumetric flow).

TIM-ID: 0000017544 - 001

063 – HI P-Crank Case

ZKP-Number:

Yellow alarm.

Associated parameter 2.0106.931

Cause	Corrective action
Crankcase pressure too high (limit value 1). Restrictor valve in crankcase breather is closed too much, air filter is defective, oil separator is clogged, piston rings are seized, other damage to crank drive.	1. Check crank drive: • Crank engine (→ Page 133). • Endoscope combustion chambers from bottom dead center to top dead center. 2. Check air filter for contamination, replace if contamination is visible (→ Page 154), 3. Check setting of BlowBy restrictor valve. 4. Check oil separator condition, replace if necessary (→ Page 135).

064 – SS P-Crank Case

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0106.932

Cause	Corrective action
Crankcase pressure too high (limit value 2). Restrictor valve in crankcase breather is closed too much, air filter is defective, oil separator is clogged, piston rings are seized, other damage to crank drive.	1. Check crank drive: • Crank engine (→ Page 133). • Endoscope combustion chambers from bottom dead center to top dead center. 2. Check air filter for contamination, replace if contamination is visible (→ Page 154), 3. Check setting of BlowBy restrictor valve. 4. Check oil separator condition, replace if necessary (→ Page 135).

067 – HI T-Coolant

ZKP-Number:

Yellow alarm.

Associated parameter 2.0120.931

Cause	Corrective action
Coolant temperature after engine too high (limit value 1). Engine coolant pump failure, volumetric flow too low, air in engine coolant circuit.	▶ Check engine coolant circuit.

TIM-ID: 0000017544 - 001

068 – SS T-Coolant

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0120.932

Cause	Corrective action
Coolant temperature after engine too high (limit value 2). Engine coolant pump failure, volumetric flow too low, air in engine coolant circuit.	▶ Check engine coolant circuit.

089 – SS Engine Speed too Low

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.2500.030

Cause	Corrective action
Engine is stalled. Engine speed in normal operation has fallen below the limit value of parameter 2.2500.027 (speed limit for stalling) without an active stop command. The engine is shutdown for safety reasons.	1. In parallel operation connected to mains: • Check mains for frequency drop. • Check generator and coupling for damage. 2. In isolated operation: • Check throttle position. • Check throttles for implausible closing. If throttles are fully open: Check if load step values are admissible. • Check bypass position. • Check air filter for contamination, replace if contamination is visible (→ Page 154), • Check exhaust back pressure. • Check differential pressure over mixture cooler. • Check emissions and injection timing (→ Page 137). • Check oil separator efficiency (oil in compressor intake elbow), clean compressor if necessary. • Check valve clearance (→ Page 148). • Check gasket between mixture line and cylinder head for correct installation position.

090 – SS Idle Speed Not Reached

ZKP-Number:

Red alarm. Start terminated.

Associated parameter 2.1090.925

Cause	Corrective action
Idling speed not attained.	1. Check ignition. 2. Check gas supply. 3. Check mixture setting.

TIM-ID: 0000017544 - 001

091 – SS Release Speed Not Reached

ZKP-Number:

Red alarm. Start terminated.

Associated parameter 2.1090.924

Cause	Corrective action
The speed (starter DISENGAGE) was not attained, ignition not working or no gas available.	1. Check ignition. 2. Check gas supply. 3. Check mixture setting.

092 – SS Starter Speed Not Reached

ZKP-Number:

Red alarm. Start terminated.

Associated parameter 2.1090.923

Cause	Corrective action
Minimum speed for flushing process and ignition release was not attained.	▶ Check starter system.

093 – SS T-Preheat

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.1090.922

Cause	Corrective action
Preheating temperature too low (limit value 2). Coolant temperature too low for engine start.	1. Check preheating. 2. Check differential coolant pressure. 3. Check heating elements. 4. Check cabling.

094 – LO T-Preheat

ZKP-Number:

Yellow alarm.

Associated parameter 2.1090.921

Cause	Corrective action
Preheating temperature too low (limit value 1). Coolant temperature too low for engine start.	1. Check preheating. 2. Check differential coolant pressure. 3. Check heating elements. 4. Check cabling.

TIM-ID: 0000017544 - 001

095 – AL Prelubrication Fault

ZKP-Number:

Red alarm. Start terminated.

Associated parameter 2.1090.920

Cause	Corrective action
Oil priming fault.	1. Check oil pressure, oil temperature, oil level. 2. Check oil priming pump.

104 – AL Eng Hours Counter Defect

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.623

Cause	Corrective action
Hour meter faulty. Internal governor fault.	▶ Replace engine governor.

118 – LO ECU Supply Voltage

ZKP-Number:

Yellow alarm.

Associated parameter 2.0140.921

Cause	Corrective action
Supply voltage too low (limit value 1).	1. Check supply voltage. 2. Check cabling.

119 – LOLO ECU Supply Voltage

ZKP-Number:

Red alarm.

Associated parameter 2.0140.922

Cause	Corrective action
Supply voltage too low (limit value 2).	1. Check supply voltage. 2. Check cabling.

120 – HI ECU Supply Voltage

ZKP-Number:

Yellow alarm.

Associated parameter 2.0140.931

Cause	Corrective action
Supply voltage too high (limit value 1).	1. Check supply voltage. 2. Check cabling.

TIM-ID: 0000017544 - 001

121 – HIHI ECU Supply Voltage

ZKP-Number:

Red alarm.

Associated parameter 2.0140.932

Cause	Corrective action
Supply voltage too high (limit value 2).	1. Check supply voltage. 2. Check cabling.

122 – HI T-ECU

ZKP-Number:

Yellow alarm.

Associated parameter 2.0132.921

Cause	Corrective action
Electronics temperature too high (limit value 1).	▶ Improve cooling of governor. Reduce room temperature, check air flow to ADEC.

176 – AL LifeData not available

ZKP-Number:

Red alarm.

Associated parameter 2.4000.004

Cause	Corrective action
No (suitable) LifeData backup system available after expiry of timeout following ECU reset. Backup system has no LifeData feature or CAN bus to backup system is disrupted.	▶ Contact Service. (error on project data).

177 – AL LifeData restore incomplete

ZKP-Number:

Red alarm.

Associated parameter 2.4000.006

Cause	Corrective action
This fault message is generated if a CRC is faulty (is indicated for each module) during a restore data upload (in the ADEC) or if the upload is incomplete.	▶ Power up ECU, contact Service.

TIM-ID: 0000017544 - 001

180 – AL CAN1 Node Lost

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.680

Cause	Corrective action
Bus node (SAM or EMU) lost on CAN bus 1.	▶ Check operation of nodes and cabling. Busses (CAN bus 1 and CAN bus 2) are redundant.

181 – AL CAN2 Node Lost

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.681

Cause	Corrective action
Bus node (SAM or EMU) lost on CAN bus 2.	▶ Check operation of nodes and cabling. Busses (CAN bus 1 and CAN bus 2) are redundant.

182 – AL CAN Wrong Parameters

ZKP-Number:

Red alarm.

Associated parameter 2.0500.682

Cause	Corrective action
Incorrect parameter values entered in data record.	▶ Contact Service (configuration fault).

183 – AL CAN No PU-Data

ZKP-Number:

Red alarm.

Associated parameter 2.0500.683

Cause	Corrective action
A CAN mode has been selected in which communication with the PU data module is initialized. However, the required PU data module is not available or not valid.	▶ Contact Service (configuration fault).

TIM-ID: 0000017544 - 001

184 – AL CAN PU-Data Flash Error

ZKP-Number:

Red alarm.

Associated parameter 2.0500.684

Cause	Corrective action
A programming error occurred when attempting to copy a received PU data module into the Flash module.	▶ Contact Service (configuration fault).

186 – AL CAN1 Bus Off

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.686

Cause	Corrective action
CAN controller 1 is in “Bus-Off” status. Automatic switching to CAN bus 2. Bus users (ECU, SAM or EMU) faulty.	▶ Check operation of nodes and cabling.

187 – AL CAN1 Error Passive

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.687

Cause	Corrective action
CAN controller 1 has signaled a warning. Bus nodes (ECU, SAM or EMU) are faulty.	▶ Check operation of nodes and cabling.

188 – AL CAN2 Bus Off

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.688

Cause	Corrective action
CAN controller 2 is in “Bus-Off” status. Automatic switching to CAN bus 1. Bus users (ECU, SAM or EMU) faulty.	▶ Check operation of nodes and cabling.

TIM-ID: 0000017544 - 001

189 – AL CAN2 Error Passive

ZKP-Number:

Yellow alarm.

Associated parameter 2.0500.689

Cause	Corrective action
CAN controller 2 has signaled a warning. The cause may be e.g. missing listening nodes, minor malfunctions or temporary bus overload.	▶ Check operation of nodes (ECU, SAM or EMU) and cabling.

190 – AL EMU Parameter Not Supported

ZKP-Number:

Red alarm.

Associated parameter 2.0500.690

Cause	Corrective action
EMU parameters are not supported.	▶ Contact Service (configuration fault).

201 – SD T-Coolant

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.570

Cause	Corrective action
Coolant temperature sensor at engine outlet defective, short circuit or wire break.	▶ Check sensor and cabling (B6.1), replace if necessary. Fault is rectified when engine is restarted.

204 – SD Level Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.602

Cause	Corrective action
Engine oil level sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B24), replace as necessary. Fault is rectified when engine is restarted.

TIM-ID: 0000017544 - 001

206 – SD T-Exhaust A

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.576

Cause	Corrective action
Exhaust temperature sensor on A side defective, short circuit or wire break.	▶ Check sensor and cabling (B4.21), replace if necessary. Fault is rectified when engine is restarted.

207 – SD T-Exhaust B

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.577

Cause	Corrective action
Exhaust temperature sensor on B side defective, short circuit or wire break.	▶ Check sensor and cabling (B4.22), replace if necessary. Fault is rectified when engine is restarted.

211 – SD P-Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.563

Cause	Corrective action
Engine oil pressure sensor after filter defective, short circuit or wire break.	▶ Check sensor and cabling (B5.1), replace as necessary. Fault is rectified when engine is restarted.

212 – SD P-Coolant

ZKP-Number:

Red alarm.

Associated parameter 1.8004.564

Cause	Corrective action
Coolant pressure sensor after engine defective, short circuit or wire break.	▶ Check sensor and cabling (B16.1), replace if necessary. Fault is rectified when engine is restarted.

TIM-ID: 0000017544 - 001

214 – SD P-Crank Case

ZKP-Number:

Red alarm.

Associated parameter 1.8004.568

Cause	Corrective action
Crankcase pressure sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B50), replace as necessary. Fault is rectified when engine is restarted.

216 – SD T-Lube Oil

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.575

Cause	Corrective action
Engine oil temperature sensor after oil heat exchanger defective, short circuit or wire break.	▶ Check sensor and cabling (B7), replace as necessary. Fault is rectified when engine is restarted.

219 – SD T-Intake Air

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.573

Cause	Corrective action
Intake air temperature sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B49.2), replace as necessary. Fault is rectified when engine is restarted.

221 – SD P-Diff Lube Oil

ZKP-Number:

Red alarm.

Associated parameter 1.8004.585

Cause	Corrective action
Engine oil pressure sensors defective, short circuit or wire break.	▶ Check sensor and cabling before filter (B5.3) and after filter (B5.1), replace as necessary. Fault is rectified when engine is restarted.

TIM-ID: 0000017544 - 001

227 – SD P- Lube Oil before Filter

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.620

Cause	Corrective action
Engine oil pressure sensor before filter defective, short circuit or wire break.	▶ Check sensor and cabling (B5.3), replace as necessary. Fault is rectified when engine is restarted.

229 – AL Stop Camshaft Sensor Defect

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.562

Cause	Corrective action
Engine stop due to camshaft sensor fault (and a prior crankshaft sensor fault in the same operating cycle).	▶ Check sensor and cabling (B1.1), replace if necessary. Fault is rectified when engine is restarted.

231 – SD Camshaft Speed

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.499

Cause	Corrective action
Camshaft sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B1.1), replace if necessary. Fault is rectified when engine is restarted.

232 – SD Charger 1 Speed

ZKP-Number:

Yellow alarm.

Associated parameter 1.3011.128

Cause	Corrective action
Speed sensor of primary turbocharger defective, short circuit or wire break.	▶ Turbocharger speed sensor is not fitted at present.

TIM-ID: 0000017544 - 001

233 – SD Charger 2 Speed

ZKP-Number:

Yellow alarm.

Associated parameter 1.3011.129

Cause	Corrective action
Speed sensor of secondary turbocharger defective, short circuit or wire break.	▶ Turbocharger speed sensor is not fitted at present.

245 – SD ECU Power Supply Voltage

ZKP-Number:

Red alarm.

Associated parameter 2.8006.589

Cause	Corrective action
Internal governor fault.	▶ Replace ADEC engine governor.

266 – SD Speed Demand

ZKP-Number:

Red alarm.

Associated parameter 2.8006.586

Cause	Corrective action
Speed setting signal can no longer be transmitted from plant.	▶ Check signal and cabling between plant and ADEC.

381 – AL Wiring TOP 1

ZKP-Number:

Yellow alarm.

Associated parameter 2.8006.638

Cause	Corrective action
Short circuit or wire break on transistor output, plant-side 1 (TOP 1). Activation of yellow combined alarm faulty.	▶ Check cabling.

TIM-ID: 0000017544 - 001

382 – AL Wiring TOP 2

ZKP-Number:

Red alarm.

Associated parameter 2.8006.639

Cause	Corrective action
Short circuit or wire break on transistor output, plant-side 2 (TOP 2). Activation of red combined alarm faulty.	▶ Check cabling.

383 – AL Wiring TOP 3

ZKP-Number:

Red alarm.

Associated parameter 2.8006.640

Cause	Corrective action
Short circuit or wire break on transistor output, plant-side 3 (TOP 3). Activation of gas supply solenoid valve No.1 faulty.	▶ Check cabling.

384 – AL Wiring TOP 4

ZKP-Number:

Red alarm.

Associated parameter 2.8006.641

Cause	Corrective action
Short circuit or wire break on transistor output, plant-side 4 (TOP 4). Activation of gas supply solenoid valve No.2 faulty.	▶ Check cabling.

418 – SD T-Intake Air B

ZKP-Number:

Yellow alarm.

Associated parameter 1.8004.603

Cause	Corrective action
Intake air temperature sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B49.2), replace if necessary.

TIM-ID: 0000017544 - 001

419 – SD T-Coolant b. Engine

ZKP-Number:

Red alarm.

Associated parameter 1.8004.604

Cause	Corrective action
Coolant temperature sensor at engine inlet defective, short circuit or wire break.	▶ Check sensor and cabling (B6.3), replace if necessary.

423 – LO P-Coolant Diff.

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0180.921

Cause	Corrective action
Coolant differential pressure too low. Volumetric flow too low.	▶ Check engine coolant circuit (pressure and volumetric flow).

429 – HI P-Coolant

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0101.931

Cause	Corrective action
Coolant pressure after engine too high (limit value 3).	▶ Check engine coolant circuit (pressure and volumetric flow).

430 – LO P-Coolant before Engine

ZKP-Number:

Yellow alarm.

Associated parameter 2.0168.921

Cause	Corrective action
Coolant pressure before engine too low (limit value 1). Volumetric flow too low, static pressure too low.	▶ Check engine coolant circuit (pressure and volumetric flow).

TIM-ID: 0000017544 - 001

431 – SS P-Coolant before Engine

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0168.922

Cause	Corrective action
Coolant pressure before engine too low (limit value 2). Volumetric flow too low, static pressure too low.	▶ Check engine coolant circuit (pressure and volumetric flow).

434 – HI T-Coolant before Engine

ZKP-Number:

Yellow alarm.

Associated parameter 2.0173.931

Cause	Corrective action
Coolant temperature before engine too high (limit value 1). Engine coolant pump failure, volumetric flow too low, air in engine coolant circuit.	▶ Check engine coolant circuit (pressure and volumetric flow).

435 – SS T-Coolant before Engine

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0173.932

Cause	Corrective action
Coolant temperature before engine too high (limit value 2). Engine coolant pump failure, volumetric flow too low, air in engine coolant circuit.	▶ Check engine coolant circuit (pressure and volumetric flow).

443 – HI P-Charge Mix Diff.

ZKP-Number:

Yellow alarm.

Associated parameter 2.0183.931

Cause	Corrective action
Difference in mixture pressures sensed on A and B side is too high (limit value 1).	1. Check throttles for varying positions and malfunction. 2. Check mixture lines for leakage. 3. Check sensors and cabling (B79.22, B79.21).

TIM-ID: 0000017544 - 001

447 – HIHI P-Charge Mix Diff.

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0183.932

Cause	Corrective action
Difference in mixture pressures sensed on A and B side is too high (limit value 2).	1. Check throttles for varying positions and malfunction. 2. Check mixture lines for leakage. 3. Check sensors and cabling (B79.22, B79.21).

451 – HI T-Charge Mix

ZKP-Number:

Yellow alarm.

Associated parameter 2.0169.931

Cause	Corrective action
Mixture temperature is too high (limit value 1). Mixture coolant pump failure, volumetric flow too low, cooling system inlet temperature too high, mixture cooler clogged.	1. Check mixture cooling circuit. 2. Check mixture cooler for dirt.

452 – HIHI T-Charge Mix

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0169.932

Cause	Corrective action
Mixture temperature is too high (limit value 2). Mixture coolant pump failure, volumetric flow too low, cooling system inlet temperature too high, mixture cooler clogged.	1. Check mixture cooling circuit. 2. Check mixture cooler for dirt.

453 – LO T-Charge Mix

ZKP-Number:

Yellow alarm.

Associated parameter 2.0169.921

Cause	Corrective action
Mixture temperature is too low (limit value 3).	1. Check intake air temperature. 2. Check mixture cooling circuit.

TIM-ID: 0000017544 - 001

454 – SS Power Reduction Active

ZKP-Number:

Yellow alarm.

Associated parameter 2.7000.011

Cause	Corrective action
Power reduction activated.	▶ Rectify limit value violation of the source alarm (e.g. reduce intake air temperature).

457 – LO T-Intake Air

ZKP-Number:

Yellow alarm.

Associated parameter 2.0123.921

Cause	Corrective action
Intake air temperature is too low (limit value 3).	▶ Check ventilation system.

458 – LOLO T-Intake Air

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0123.922

Cause	Corrective action
Intake air temperature is too low (limit value 4).	▶ Check ventilation system.

459 – SD P-Coolant b. Engine

ZKP-Number:

Red alarm.

Associated parameter 1.8004.627

Cause	Corrective action
Coolant pressure sensor before engine defective, short circuit or wire break.	▶ Check sensor and cabling (B16.3), replace if necessary. Fault is rectified when engine is restarted.

470 – SD T-ECU

ZKP-Number:

Red alarm.

Associated parameter 1.8004.587

Cause	Corrective action
Temperature sensor for engine governor defective, short circuit or wire break.	▶ Check sensor and cabling, replace as necessary. Fault is rectified when engine is restarted.

TIM-ID: 0000017544 - 001

472 – AL Stop SD

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.8006.593

Cause	Corrective action
Engine stop, since all shutdown channels detect “sensor defect".	▶ Combined alarm (for details, refer to the source alarm).

473 – AL Wiring PWM_CM2

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.593

Cause	Corrective action
Cable break or short circuit on channel PWM_CM2.	▶ Check cabling to bypass throttle, replace bypass throttle if necessary.

476 – AL Crash Rec.Init Fault

ZKP-Number:

Red alarm.

Associated parameter 1.8010.007

Cause	Corrective action
Crash recorder initialization error.	▶ Contact Service.

478 – AL Comb. Alarm Yel (Plant)

ZKP-Number:

Yellow alarm.

Associated parameter 2.8006.001

Cause	Corrective action
Combined alarm YELLOW from plant.	▶ Combined alarm (for details, refer to the source alarm).

479 – AL Comb. Alarm Red (Plant)

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.8006.002

Cause	Corrective action
Combined alarm RED from plant.	▶ Combined alarm (for details, refer to the source alarm).

TIM-ID: 0000017544 - 001

496 – SD P-Charge Mix A

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.628

Cause	Corrective action
Mixture pressure sensor on A side defective, short circuit or wire break.	▶ Check sensor and cabling (B79.21), replace if necessary. Fault is rectified when engine is restarted.

497 – SD P-Charge Mix B

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.8004.629

Cause	Corrective action
Mixture pressure sensor on B side defective, short circuit or wire break.	▶ Check sensor and cabling (B79.22), replace if necessary. Fault is rectified when engine is restarted.

498 – SD P-Charge Mix Diff

ZKP-Number:

Red alarm.

Associated parameter 1.8004.630

Cause	Corrective action
Mixture differential pressure sensor on A or B side defective, short circuit or wire break.	▶ Check sensors and cabling (B79.21, B79.22), replace if necessary. Fault is rectified when engine is restarted.

499 – SD T-Charge Mix

ZKP-Number:

Red alarm.

Associated parameter 1.8004.632

Cause	Corrective action
Mixture temperature sensor defective, short circuit or wire break.	▶ Check sensor and cabling (B73), replace as necessary. Fault is rectified when engine is restarted.

TIM-ID: 0000017544 - 001

511 – HIHI P-Charge Mix A

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0181.932

Cause	Corrective action
Mixture pressure on A side too high (limit value 2).	1. Check emissions. 2. Check ignition timing (→ Page 137). 3. Check exhaust back pressure. 4. Check valve clearance (→ Page 148). 5. Check throttle. 6. Check mixture coolant system.

512 – HIHI P-Charge Mix B

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0182.932

Cause	Corrective action
Mixture pressure on B side too high (limit value 2).	1. Check emissions. 2. Check ignition timing (→ Page 137). 3. Check exhaust back pressure. 4. Check valve clearance (→ Page 148). 5. Check throttle. 6. Check mixture coolant system.

513 – SD P-Coolant Diff

ZKP-Number:

Red alarm.

Associated parameter 1.8004.610

Cause	Corrective action
Coolant differential pressure sensor defective, short circuit or wire break.	▶ Check sensors and cabling (B16.1, B16.3), replace if necessary. Fault is rectified when engine is restarted.

515 – AL Starter Not Engaged

ZKP-Number:

Yellow alarm.

Associated parameter 2.1090.926

Cause	Corrective action
ECU does not detect engine speed during starting sequence.	1. Check starter. 2. Check cabling. 3. Check speed sensor.

TIM-ID: 0000017544 - 001

517 – SD P-Charge Mix before Throttle

ZKP-Number:

Red alarm.

Associated parameter 1.8004.631

Cause	Corrective action
Mixture pressure sensor before throttle defective, short circuit or wire break.	▶ Check sensor and cabling (B79.23), replace if necessary. Fault is rectified when engine is restarted.

520 – SD P-Intake Air after Filter A

ZKP-Number:

Yellow alarm.

Associated parameter 1.0186.900

Cause	Corrective action
Intake air pressure sensor after filter on A side defective, short circuit or wire break.	▶ Check sensor and cabling (B81.1), replace if necessary. Fault is rectified when engine is restarted.

522 – SD P-Intake Air after Filter B

ZKP-Number:

Yellow alarm.

Associated parameter 1.0187.900

Cause	Corrective action
Intake air pressure sensor after filter on B side defective, short circuit or wire break.	▶ Check sensor and cabling (B81.2), replace if necessary. Fault is rectified when engine is restarted.

531 – AL Wiring PWM_CM1

ZKP-Number:

Red alarm.

Associated parameter 1.1044.900

Cause	Corrective action
Cable break or short circuit on channel PWM_CM1.	▶ Check cabling to TecJet throttle, replace TecJet throttle if necessary.

TIM-ID: 0000017544 - 001

532 – AL Wiring PWM1

ZKP-Number:

Red alarm.

Associated parameter 1.1046.900

Cause	Corrective action
Wire break or short circuit on channel PWM1.	▶ Check wiring to mixture throttle on A side, replace mixture throttle on A side if necessary.

533 – AL Wiring PWM2

ZKP-Number:

Red alarm.

Associated parameter 1.1047.900

Cause	Corrective action
Wire break or short circuit on channel PWM2.	▶ Check wiring to mixture throttle on B side, replace mixture throttle on B side if necessary.

543 – AL Multiple FDH Slaves

ZKP-Number:

Yellow alarm.

Associated parameter 2.0555.005

Cause	Corrective action
More than one device is activated as backup medium for FDH.	▶ Contact Service (configuration fault).

544 – AL Configuration Changed

ZKP-Number:

Yellow alarm.

Associated parameter 2.0555.003

Cause	Corrective action
This alarm is activated when the system configuration was changed, e.g. because the ECU or SAM was exchanged.	▶ Contact Service (configuration fault).

TIM-ID: 0000017544 - 001

552 – AL GasControlCheck Fault

ZKP-Number:

Red alarm.

Associated parameter 2.1090.118

Cause	Corrective action
Gas train test was not successful. Alarm is activated if the gas train does not report OK within a specified time-out period. Either the gas train leak test was not successful, the time-out period is set too short, or communication is faulty.	1. Check gas train. 2. Check cabling.

554 – AL Ignition Fault

ZKP-Number:

Red alarm.

Associated parameter 2.1090.122

Cause	Corrective action
Ignition failure. Alarm is activated if the feedback signal from ignition system is not received within a specified time-out period. Either the ignition could not be activated, the time-out period is set too short, or communication is faulty.	▶ Check ignition system and cabling.

556 – AL GasValve Fault

ZKP-Number:

Red alarm.

Associated parameter 2.1090.124

Cause	Corrective action
Gas supply solenoid valve faulty. Either the gas supply solenoid valves are faulty, the time-out period is set too short, or communication is faulty.	▶ Check gas train and cabling.

TIM-ID: 0000017544 - 001

557 – AL speed drop fault

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.1090.126

Cause	Corrective action
Speed drop. Alarm is activated if engine speed drops during starting sequence.	▶ Check gas train.

559 – AL mixture throttle A fault

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.1450.010

Cause	Corrective action
A problem related to mixture throttle on A side occurred. Possible causes: Mixture throttle defective, no power supply to throttle, cabling of feedback and/ or position signal faulty.	▶ Check mixture throttle on A side and cabling. Replace mixture throttle on A side if necessary.

560 – AL mixture throttle B fault

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 1.1450.013

Cause	Corrective action
A problem related to mixture throttle on B side occurred. Possible causes: Mixture throttle defective, no power supply to throttle, cabling of feedback and/ or position signal faulty.	▶ Check mixture throttle on B side and cabling. Replace mixture throttle on B side if necessary.

565 – AL L1 P-Intake Air after Filter A

ZKP-Number:

Yellow alarm.

Associated parameter 2.0186.921

Cause	Corrective action
Pressure loss over air filter on A side is too high.	▶ Replace air filter (→ Page 154).

TIM-ID: 0000017544 - 001

566 – AL L2 P-Intake Air after Filter A

ZKP-Number:

Yellow alarm.

Associated parameter 2.0186.931

Cause	Corrective action
Pressure loss over air filter on A side is too high.	▶ Replace air filter (→ Page 154).

567 – AL L1 P-Intake Air after Filter B

ZKP-Number:

Yellow alarm.

Associated parameter 2.0187.921

Cause	Corrective action
Pressure loss over air filter on B side is too high.	▶ Replace air filter (→ Page 154).

568 – AL L2 P-Intake Air after Filter B

ZKP-Number:

Yellow alarm.

Associated parameter 2.0187.931

Cause	Corrective action
Pressure loss over air filter on B side is too high.	▶ Replace air filter (→ Page 154).

569 – AL SAM Missing Data Fault

ZKP-Number:

Red alarm.

Associated parameter 2.1090.128

Cause	Corrective action
This alarm is activated if the ECU does not receive some messages to be transmitted from SAM. Possible problem related to CAN bus, SAM does not work properly or a device connected to SAM does not work properly so that SAM cannot transmit the messages from this device successfully.	▶ Check the cabling/connectors of the devices connected to SAM and ECU bus. Replace devices if necessary.

TIM-ID: 0000017544 - 001

570 – L1 AI CAN Max Retarded Timing

ZKP-Number:

Yellow alarm.

Associated parameter 2.1200.931

Cause	Corrective action
The cylinder set to maximum retarded timing due to knocking has violated the first limit value.	1. Check emissions. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

571 – L2 AI CAN Max Retarded Timing

ZKP-Number:

Yellow alarm. Power reduction.

Associated parameter 2.1200.932

Cause	Corrective action
The cylinder set to maximum retarded timing due to knocking has violated the second limit value. Power reduction is initiated.	1. Check emissions. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

572 – L3 AI CAN Max Retarded Timing

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.1200.932

Cause	Corrective action
The cylinder set to maximum retarded timing due to knocking has violated the third limit value.	1. Check emissions. 2. Check ignition timing (→ Page 137). 3. Check combustion chamber. 4. Check gas quality if feasible (methane number).

583 – AL GLS closed

ZKP-Number:

Red alarm. Engine shutdown.

Associated parameter 2.0451.005

Cause	Corrective action
Generator load switch does not open when engine stops. Engine is motoring.	▶ Check generator load switch.

TIM-ID: 0000017544 - 001

6 Task Description

6.1 Engine

6.1.1 Engine – Barring manually

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

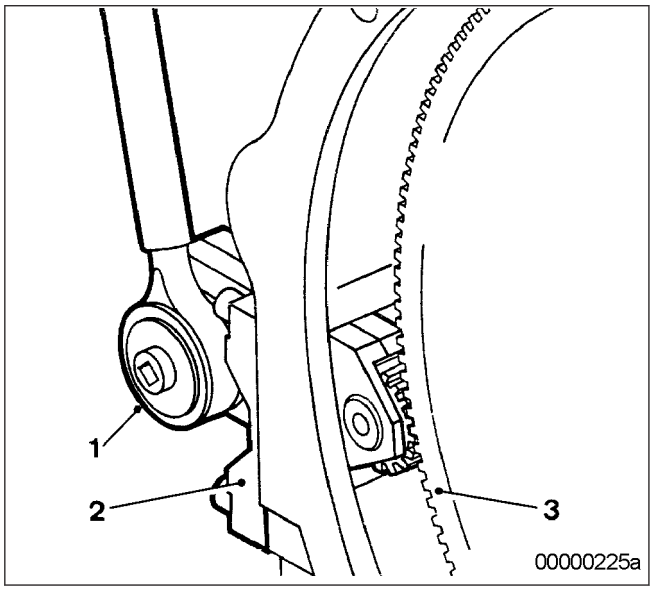
Designation / Use	Part No.	Qty.
Barring tool	F6555766	1
Ratchet head with extension	F30006212	1

DANGER

Unguarded rotating and moving engine components.
Risk of serious injury – Danger to life!
- Before barring the engine, ensure that nobody is in the danger zone.

Engine, barring manually

1. Remove guard plate.
2. Engage barring tool (2) with ring gear (3) and install on flywheel housing.
3. Apply ratchet (1) to barring gear (2).
4. Rotate crankshaft in engine direction of rotation. Apart from the normal compression resistance, there should be no abnormal resistance.
5. Remove barring tool in reverse order.



TIM-ID: 0000002531 - 001

6.1.2 Checking machine room for smell of gas

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Gas detection and alarm unit	(→ Tools Catalog)	

WARNING

Natural gas is combustible.
Risk of fire and explosion!
- Avoid open flames, electrical sparks and ignition sources.
- Do not smoke.

Checking machine room for smell of gas

1. Check machine room for smell of gas or localize gas supply leaks using gas detection and alarm unit.
2. If smell of gas is detected or the gas detection and alarm unit is triggered:
   - Avoid naked flames!
   - Avoid sparks! Do not use electrical appliances (including switches, connectors/sockets, telephone, bell).
   - Do not smoke!
   - Close main gas shutoff device!
   - Open windows and doors!
   - Warn residents and leave building!
   - Call gas supplier from outside the building!

TIM-ID: 0000002533 - 001

6.2 Crankcase Breather

6.2.1 Oil separator – Filter replacement

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Filter insert	(→ Spare Parts Catalog)	
Sealing ring	(→ Spare Parts Catalog)	
O-ring	(→ Spare Parts Catalog)	
O-ring	(→ Spare Parts Catalog)	

WARNING

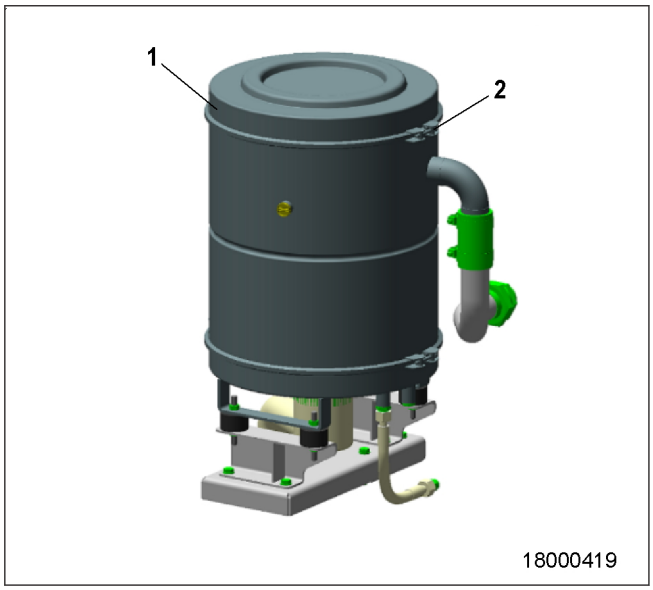
Hot oil.
Oil can contain combustion residues which are harmful to health.
Risk of injury and poisoning!
- Wear protective clothing, gloves, and goggles / safety mask.
- Avoid contact with skin.
- Do not inhale oil vapor.

WARNING

Oils/oil vapors are combustible.
Risk of fire!
- Avoid open flames, electric sparks and ignition sources.
- Do not smoke.

Oil separator – Filter replacement

1. Release clamping closure (2) on both sides and remove it.
2. Remove housing cover (1).



TIM-ID: 0000029127 - 002

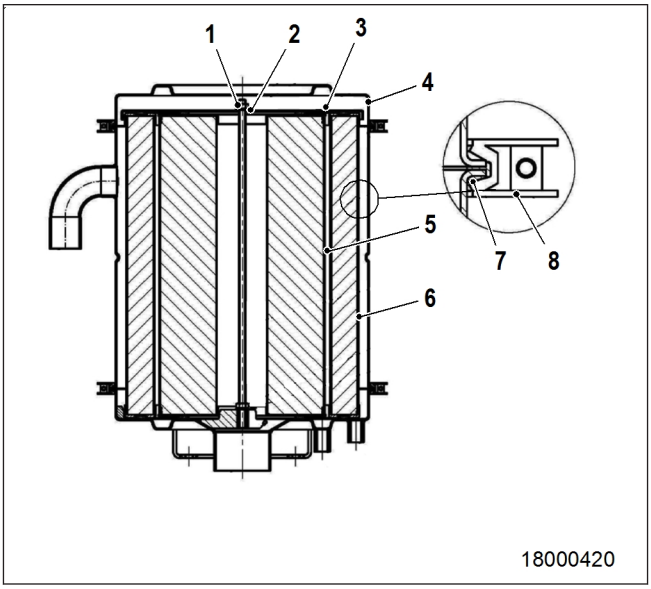
3. Remove locknut (1).
4. Remove filter cover (3) with washer (2).
5. Carefully lift out fine filter (6).
6. Carefully lift out coalescence filter (5).
7. Clean sealing faces and inside of housing.
8. Check condition of gaskets on new fine filter and new coalescence filter.

Note: The fine filter (6) must be installed in correct position in housing.

9. Place fine filter (6) in housing, ensuring it is straight.

Note: The coalescence filter (5) must be installed in correct position in housing.

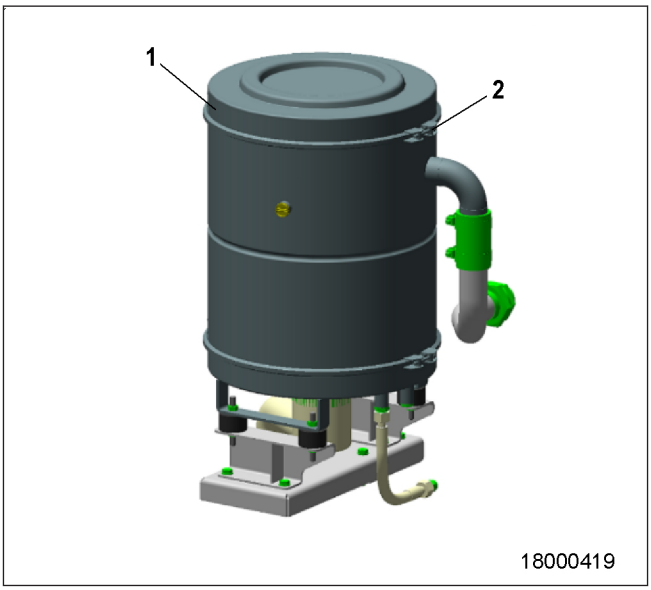
10. Place coalescence filter (5) in housing, ensuring it is straight.
11. Fit filter cover (3), ensuring it is positioned correctly.



12. Screw on washer (2) with new locknut (1) and tighten to specified tightening torque with torque wrench.

Name	Size	Type	Lubricant	Value/Standard
Locknut		Tightening torque		15 Nm

13. Fit housing cover (1).
14. Fit clamping closure (2) correctly and tighten on both sides evenly to 5 Nm.



TIM-ID: 0000029127 - 002

6.3 Ignition System

6.3.1 Ignition system – Ignition timing check

Preconditions

☑ Operating voltage of genset control system is present.

☑ Genset is disconnected from the mains.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Stroboscope	(→ Tools Catalog)	

DANGER

Unguarded rotating and moving engine components.
Risk of serious injury – danger to life!
- Before barring or starting the engine, make sure that nobody is in the danger zone.

WARNING

Engine noise above 85 dB (A).
Risk of damage to hearing!
- Wear ear protectors.

Ignition system – Ignition timing check

Note: For the specified ignition timing, contact your Service partner.

1. Stop engine (→ Page 42).
2. Install stroboscope clamp on cylinder A1 ignition cable.
3. Start engine (→ Page 40).
4. Using the stroboscope, check ignition timing on flywheel mark.
5. If the value does not correspond to specification, set ignition timing (see manufacturer's documentation for ignition system).
6. Check ignition timing.
7. Disconnect stroboscope.
8. Stop engine (→ Page 42).

64500003

TIM-ID: 0000016810 - 002

6.3.2 Spark plug connector – Replacement

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Spark plug connector	(→ Spare Parts Catalog)	

Remove spark plug connector and install new one.

▶ (→ Page 142)

TIM-ID: 0000035897 - 003

6.3.3 Spark plug connector – Removal and installation

Preconditions

☑ Engine is stopped and starting disabled.

☑ Open protective packing of new spark plug connector only immediately prior to installation.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Torque wrench, 10-60 Nm	F30452769	1
Spark plug wrench	F30452574	1
Spark plug connector with ignition line	(→ Spare Parts Catalog)	
Locking plate	(→ Spare Parts Catalog)	
Sealing ring	(→ Spare Parts Catalog)	

WARNING

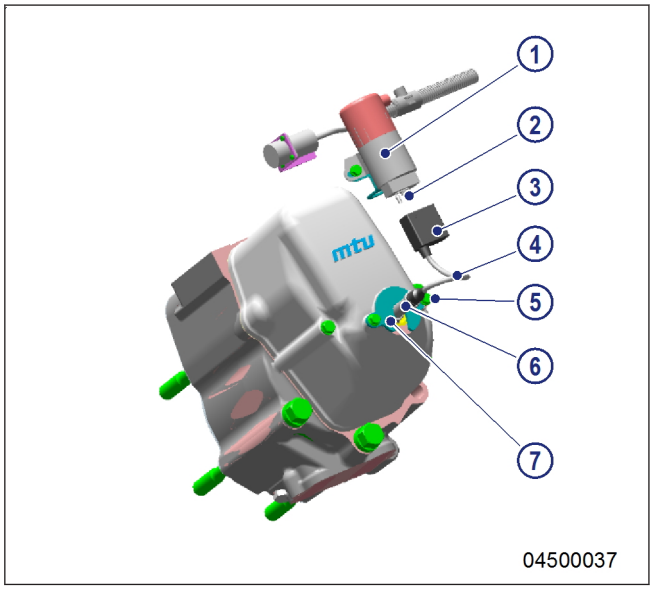
Component is hot.
Risk of burning!
- Wear protective gloves.

WARNING

Compressed air
Risk of injury!
- Do not direct compressed-air jet at persons.
- Wear protective goggles / safety mask and ear protectors.

Removing spark plug connector

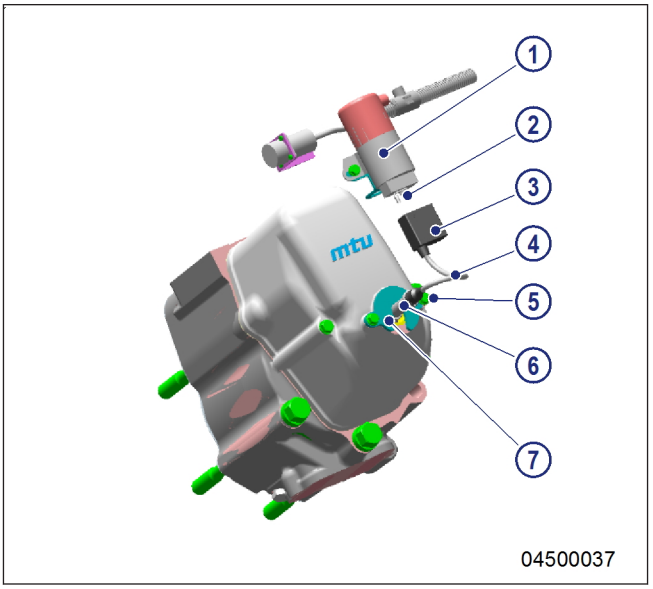
1. Remove protective cap (3) from ignition coil (1).
2. Remove screw (2), take off spring washer.
3. Remove screws (5) and tab washer (7) from cylinder head cover.
4. Remove spark plug connector (6) with ignition cable (4) from spark plug.
5. Remove sealing ring from Teflon sleeve of ignition line.



TIM-ID: 0000035898 - 003

Installing spark plug connector

1. Clean Teflon sleeve and install new sealing ring in Teflon sleeve of ignition line.
2. Fit spark plug connector (6) with ignition cable (4) on spark plug.
3. Fit locking plate (7) on cylinder head cover.
4. Screw screw (2) with spring washer onto ignition coil (1).
5. Push protective cap (3) onto ignition coil.



TIM-ID: 0000035898 - 003

6.3.4 Spark plug – Replacement

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Spark plug	(→ Spare Parts Catalog)	

Remove spark plug and install new one .

▶ (→ Page 142)

TIM-ID: 0000004224 - 001

6.3.5 Spark plug – Removal and installation

Preconditions

☑ Engine is stopped and starting disabled.

☑ Open protective packing of new spark plug only immediately prior to installation.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Torque wrench, 10-60 Nm	F30452769	1
Spark plug socket wrench, 20.8 mm	F30452574	1
Assembly compound (Molykote P 37)	50564	1
Spark plug	(→ Spare Parts Catalog)	
Sealing ring	(→ Spare Parts Catalog)	
Spark plug connector with ignition cable	(→ Spare Parts Catalog)	
Locking plate	(→ Spare Parts Catalog)	

WARNING

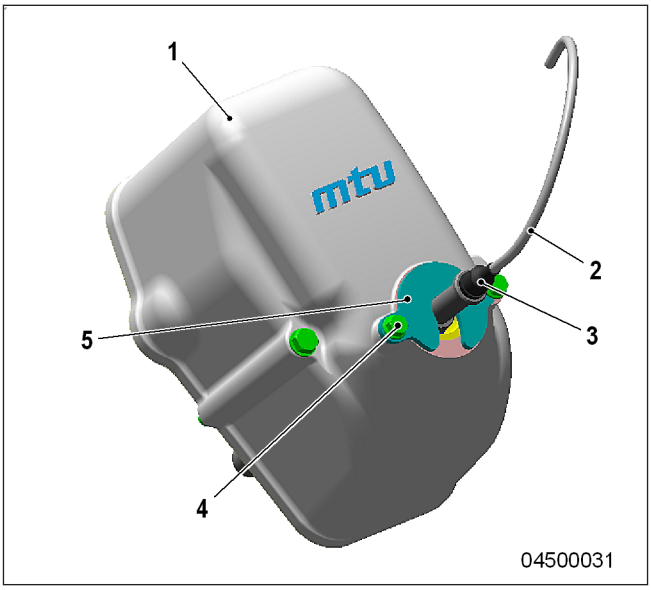
Component is hot.
Risk of burning!
- Wear protective gloves.

WARNING

Compressed air
Risk of injury!
- Do not direct compressed-air jet at persons.
- Wear protective goggles / safety mask and ear protectors.

Removing spark plug

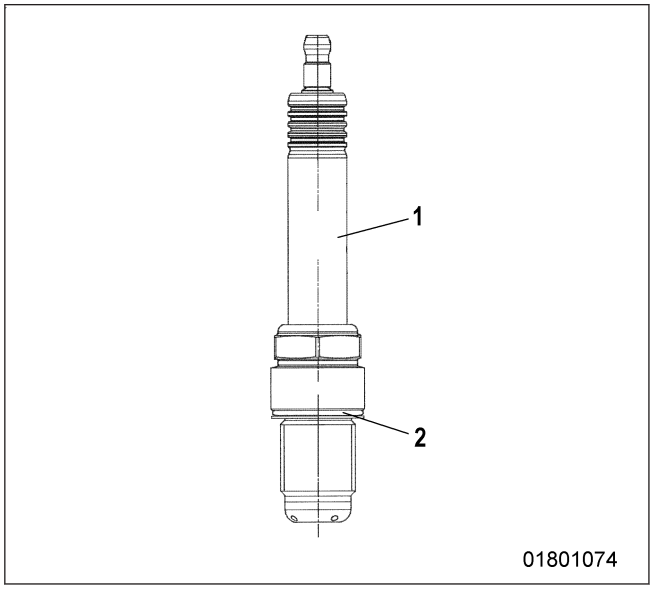
1. Remove ignition cable (2) from ignition coil.
2. Remove screws (4) and locking plate (5) from cylinder head cover (1).
3. Remove spark plug connector (3) with ignition cable (2) from spark plug.
4. Unscrew spark plug a few threads.
5. Clean spark-plug recess with compressed air.
6. Unscrew spark plug from cylinder head.
7. Remove the lower gasket on ignition line (see instructions for changing ignition line gasket).



TIM-ID: 0000029131 - 002

Installing spark plug

1. Remove dust and deposits from ignition line on side facing spark plugs so that perfect is achieved when reused.
2. Install a new lower gasket in the ignition line.
3. Check spark plug connector and ignition cable for perfect condition and replace any damaged parts.
4. Clean mating faces on spark plug, sealing ring and cylinder head.
5. Apply thin coat of assembly compound to spark plug.
6. Fit new sealing ring (2) on spark plug (1), positioning it correctly.
7. Screw spark plug into cylinder head.



Note: The temperature of spark plug and cylinder head must be the same prior to tightening.

8. Tighten spark plug to specified tightening torque using a torque wrench.

Name	Size	Type	Lubricant	Value/Standard
Spark plug	M18 x 1.5	Tightening torque	(Assembly compound (Molykote P 37))	50 Nm

9. Fit spark plug connector with ignition cable on spark plug.
10. Install locking plates on cylinder head cover.
11. Install ignition cable on ignition coil.

TIM-ID: 0000029131 - 002

6.4 Valve Drive

6.4.1 Valve gear – Lubrication

Preconditions

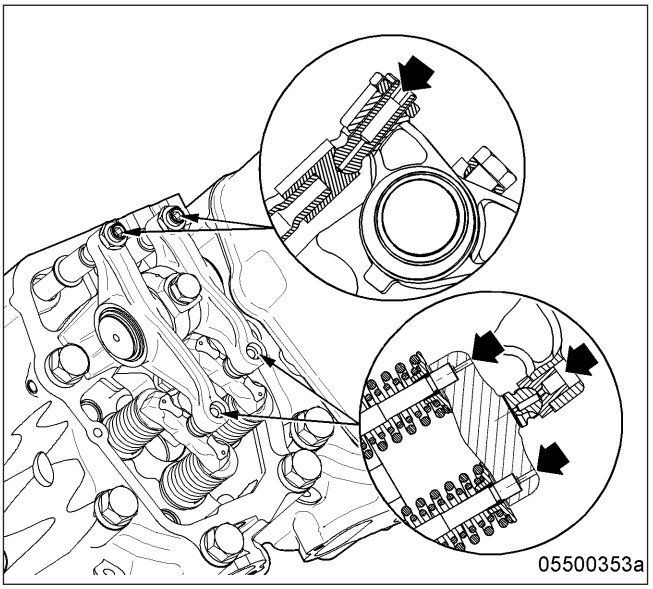
☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Engine oil		

Valve gear – Lubrication

1. Remove cylinder head covers (→ Page 152).
2. Fill oil chambers of rocker arms and adjusting screws with oil.
3. Install cylinder head covers (→ Page 152).



TIM-ID: 0000004337 - 004

6.4.2 Valve depth – Measurement

Preconditions

☑ Engine is stopped and starting disabled.

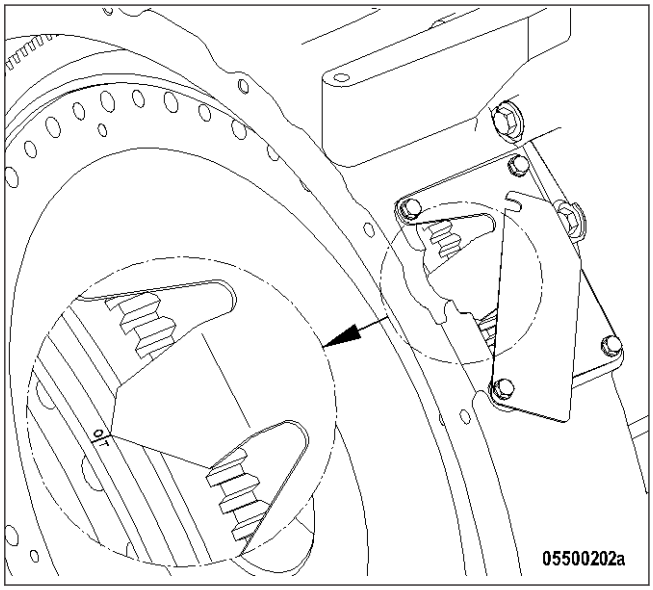
Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Depth gauge	Y20095775	1

Preparatory steps

1. Remove spark plugs (→ Page 142).
2. Remove cylinder head covers (→ Page 152).
3. Remove sleeves (arrow).
4. Install barring device (→ Page 133).

5. Rotate crankshaft with barring device in engine direction of rotation until marking “OT” and pointer are aligned.

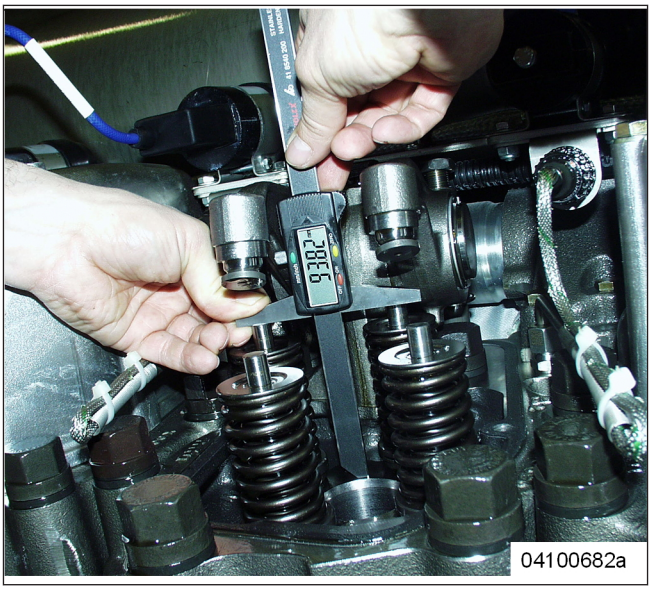


TIM-ID: 0000012015 - 002

Measuring valve depth

1. Check TDC position of piston in cylinder A1:
   - If the rocker arms are unloaded on cylinder A1, the piston is in firing TDC.
   - If the rocker arms are under load on cylinder A1, the piston is in overlap TDC.
2. Measure valve depth for each valve in two crankshaft positions (firing TDC and overlap TDC for cylinder A1) according to the diagram. Diagram (→ Page 148).
3. Release adjusting screw (1) and remove valve bridge. Do not remove rocker arm (2)!

4. Measure distance between valve stem end and cylinder head top at the spark plug bore with depth gauge (see figure).
   - The specified value for a new cylinder head: 93.8 mm.
   - Admissible wear: 3 mm.
   - If the measured value is > 96.8 mm, replace the relevant cylinder head ahead of schedule (→ Instructions for Overhaul of Assemblies).
5. Install valve bridge.
6. Adjust valve clearance (→ Page 148)



Final steps

1. Remove barring device (→ Page 133).
2. Check condition of O-rings at the sleeves, replace if damaged.

TIM-ID: 0000012015 - 002

3. Install sleeves (arrow).
4. Install cylinder head covers (→ Page 152).
5. Install spark plugs with new sealing rings (→ Page 142).

TIM-ID: 0000012015 - 002

6.4.3 Valve clearance - Check and adjustment

Preconditions

☑ Engine is stopped and starting disabled.

☑ Engine coolant temperature is max. 40 °C.

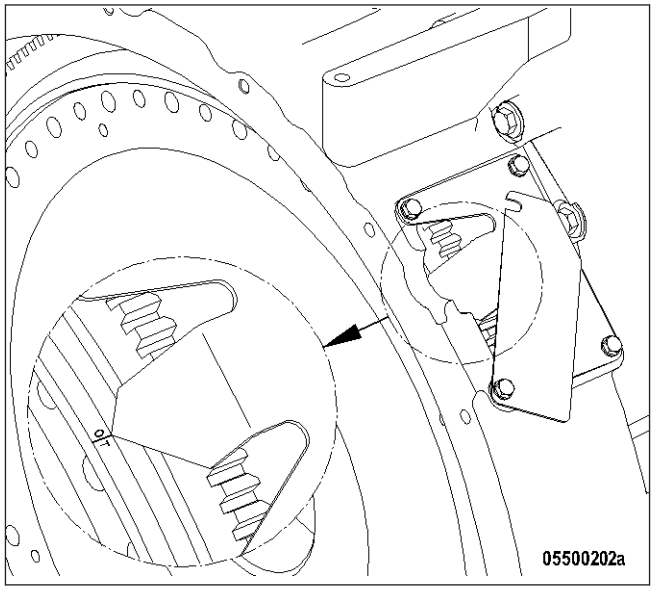
☑ Valves are closed.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Feeler gauge	Y20098771	1
Angular screw driver	F30452765	1
Torque wrench, 60-320 Nm	F30452768	1
Socket wrench, 24 mm	F30029815	1
Engine oil		

Preparatory steps

1. Remove cylinder head cover (→ Page 152).
2. Install barring tool (→ Page 133).
3. Rotate crankshaft with barring tool in engine direction of rotation until marking "OT" and pointer are aligned.



TIM-ID: 0000004368 - 002

Diagram 12V-Two crankshaft positions

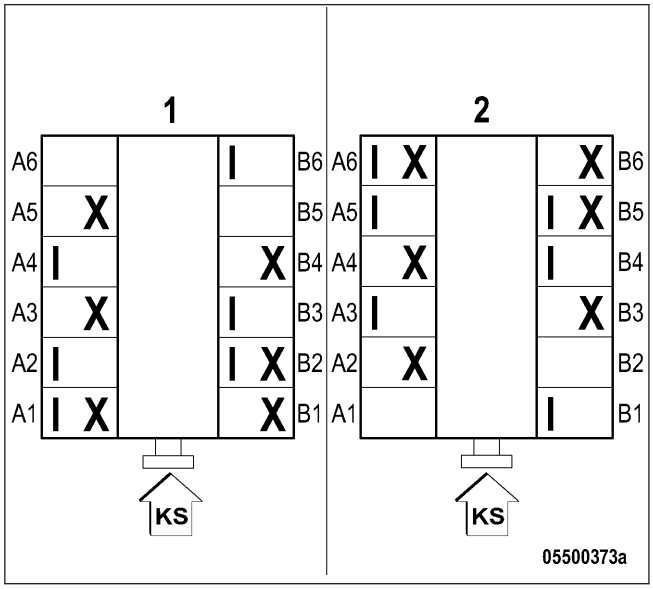
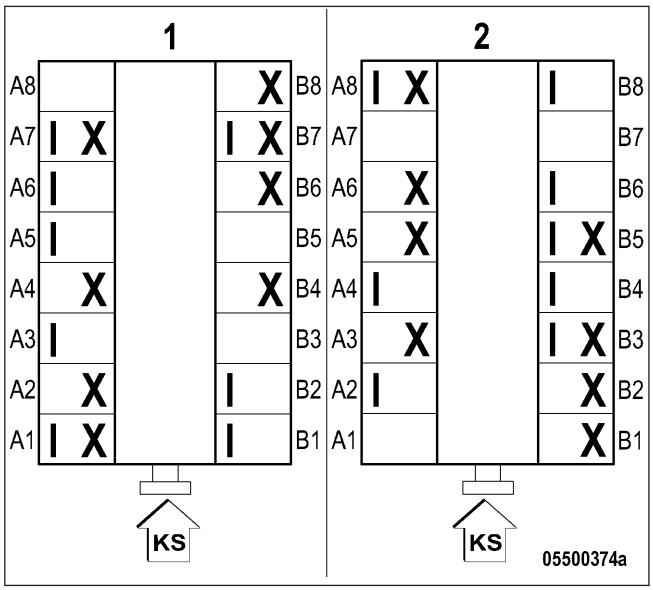


Diagram 16V-Two crankshaft positions

1 Cylinder A1 is in firing TDC
2 Cylinder A1 is in overlap TDC
I Inlet valve
X Exhaust valve



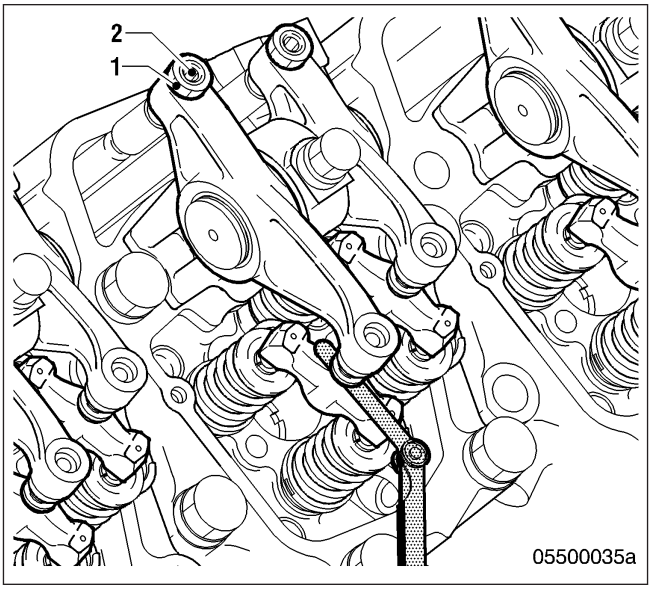
Checking valve clearance at two crankshaft positions

1. Check TDC position of piston in cylinder A1:
   - If the rocker arms are not under load on cylinder A1, the piston is in firing TDC.
   - If the rocker arms are under load on cylinder A1, the piston is in overlap TDC.
2. Check valve clearance with cold engine:
   - Inlet valves (long rocker arm) = 0.3 mm
   - Exhaust valves (short rocker arm) = 0.5 mm
3. Check all valve clearances in two crankshaft positions (firing and overlap TDC for cylinder A1) as per diagram.
4. Use feeler gauge to determine the distance between valve bridge and rocker arm.
5. If the deviation from the reference value exceeds 0.1 mm, adjust valve clearance.

TIM-ID: 0000004368 - 002

Adjusting valve clearance

1. Release locknut (1).
2. Insert feeler gauge between valve bridge and rocker arm.
3. Using angular screw driver, set adjusting screw (2) so that the specified valve clearance is provided.
4. Feeler gauge must just pass through the gap.



5. Tighten locknut (1) with torque wrench to the specified torque, holding adjusting screw (2) firm.

Name	Size	Type	Lubricant	Value/Standard
Locknut	M16	Tightening torque	(Engine oil)	90 Nm +9 Nm

6. Replace or rectify adjusting screws and/or locknuts which do not move freely.
7. Check valve clearance

Final steps

1. Remove barring tool (→ Page 133).
2. Install cylinder head cover (→ Page 152).

TIM-ID: 0000004368 - 002

6.4.4 Valve gear – Lubrication

Preconditions

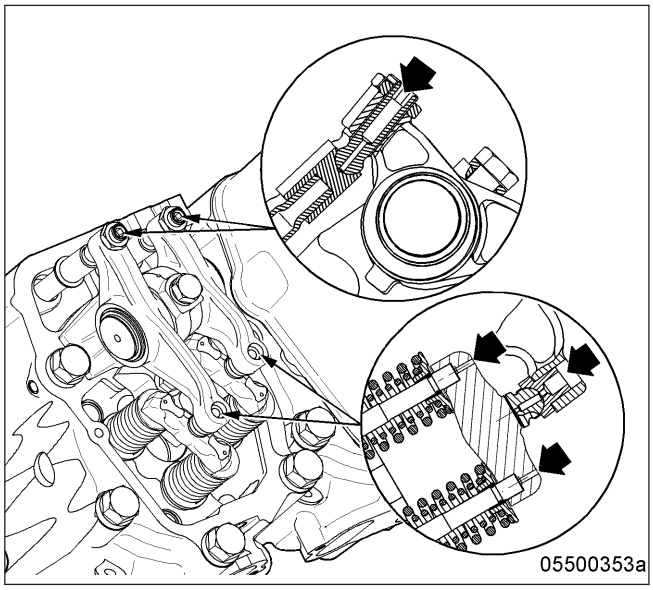
☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Engine oil		

Valve gear – Lubrication

1. Remove cylinder head covers (→ Page 152).
2. Fill oil chambers of rocker arms and adjusting screws with oil.
3. Install cylinder head covers (→ Page 152).



TIM-ID: 0000004337 - 004

6.4.5 Cylinder head cover – Removal and installation

Preconditions

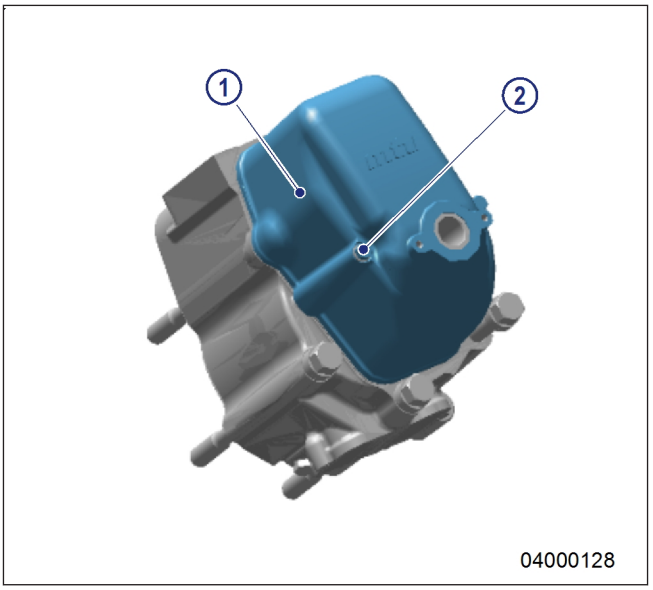
☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Gasket	(→ Spare Parts Catalog)	

Removing cylinder head cover

1. Clean very dirty cylinder head covers (1) prior to removal.
2. Remove spark plug connector (→ Page 142).
3. Unscrew screws (2).
4. Remove cylinder head cover with gasket from cylinder head.



Installing cylinder head cover

1. Clean mounting surface.
2. Check condition of gasket, replace if damaged.
3. Position gasket and cylinder head cover (1) on cylinder head.
4. Insert screws (2) in cylinder head cover and tighten them.

Note: The locking plate must be removed from the cylinder head cover.

5. Install spark plug connector (→ Page 142).

TIM-ID: 0000029133 - 002

6.5 Gas System

6.5.1 Gas supply – Checking gas lines for leaks

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Leakage detection spray		
Soap solution		

WARNING

Natural gas is combustible.
Risk of fire and explosion!
- Avoid open flames, electrical sparks and ignition sources.
- Do not smoke.

Gas supply – Checking gas lines for leaks

1. Coat all connections of the gas supply line with soap solution or spray with leakage detection spray from a distance of 30 to 50 cm.
   - Leaks are indicated by the formation of bubbles or foam.
2. Replace leaking parts.

TIM-ID: 0000004996 - 001

6.6 Air Filter

6.6.1 Air filter – Replacement

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Air filter	(→ Spare Parts Catalog)	
Fleece prefilter (optional)	(→ Spare Parts Catalog)	

Note: Air filter condition is monitored by a sensor. Replace air filter and/or (optional) fleece prefilter when the corresponding fault message appears.

Remove air filter and install new one .

▶ (→ Page 155)

TIM-ID: 0000013394 - 001

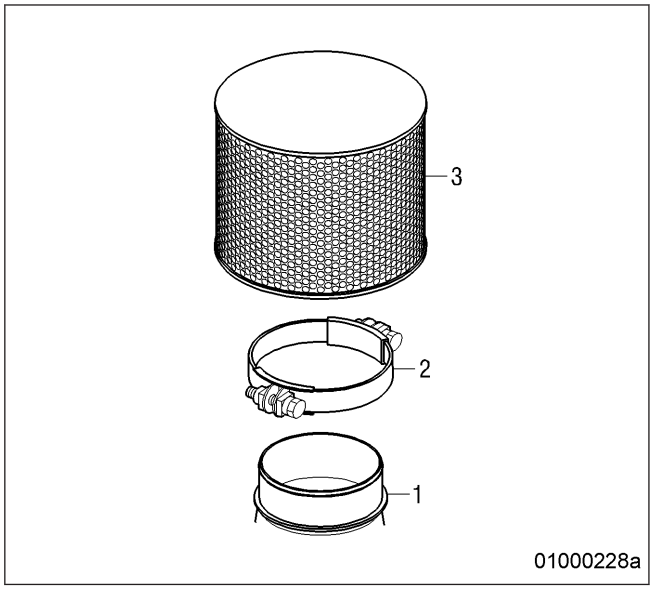
6.6.2 Air filter – Removal and installation

Preconditions

☑ Engine is stopped and starting disabled.

Air filter – Removal and installation

1. Release clamp (2).
2. Remove air filter (3) and clamp (2) from flange of intake housing (1).
3. Verify that there are no objects in the flange of the intake housing (1) and clean it.
4. Place new air filter (3) with clamp (2) onto intake housing (1).
5. Tighten clamp (2).



TIM-ID: 0000000904 - 009

6.7 Lube Oil System, Lube Oil Circuit

6.7.1 Engine oil level – Check

Preconditions

☑ Engine shut down and starting disabled.

WARNING	
	Hot oil. Oil can contain combustion residues which are harmful to health. **Risk of injury and poisoning!** • Wear protective clothing, gloves, and goggles / safety mask. • Avoid contact with skin. • Do not inhale oil vapor.

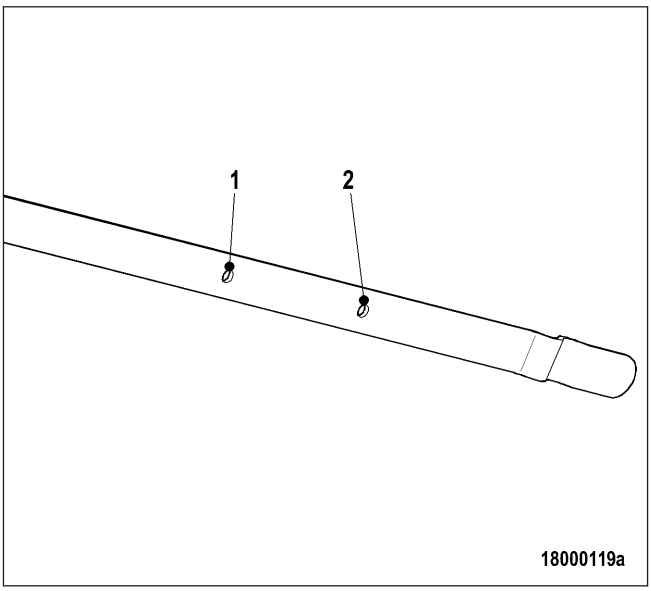
WARNING	
	Oils/oil vapors are combustible. **Risk of fire!** • Avoid open flames, electric sparks and ignition sources. • Do not smoke.

Oil level check prior to engine start

1. Withdraw oil dipstick from guide tube and wipe it.
2. Insert dipstick into guide tube up to the stop, withdraw after approx. 10 seconds and check oil level.

Note: After extended standstill, the oil level may exceed the mark (1) by up to 2 cm. The cause of this may be that oil, e.g. from the oil filter and oil heat exchanger flows back into the oil pan.

3. The oil level must reach the mark (2) or exceed the mark (1) by up to 2 cm.
4. If necessary, top up to the mark (1) (→ Page 157).
5. Insert oil dipstick into guide tube up to the stop.



Oil level check after the engine is stopped

1. 5 minutes after stopping the engine, remove oil dipstick from the guide tube and wipe it.
2. Insert dipstick into guide tube up to the stop, withdraw after approx. 10 seconds and check oil level.
3. Oil level must be between marks (1) and (2).
4. If necessary, top up to the mark (1) (→ Page 157).
5. Insert oil dipstick into guide tube up to the stop.

Checking oil level in oil storage tank

1. Check oil level.
2. Oil level must be between “min.” and “max.” marks.
3. If necessary, top up to "max." mark (→ Page 157).

TIM-ID: 0000006169 - 002

6.7.2 Engine oil – Change

Preconditions

☑ Engine is stopped and starting disabled.

☑ Engine is at operating temperature.

☑ MTU Fluids and Lubricants Specification (A001061/..) is available.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Engine oil		

WARNING

Hot oil.
Oil can contain combustion residues which are harmful to health.
Risk of injury and poisoning!
- Wear protective clothing, gloves, and goggles / safety mask.
- Avoid contact with skin.
- Do not inhale oil vapor.

Extracting engine oil

1. Open shut-off valve(s) in extraction line from engine and waste-oil tank.
2. Extract all oil from oil pan using the electric pump.
3. Close shut-off valve(s).

Filling with new engine oil

1. Determine amount of engine oil required for oil change (→ Product Summary - Technical Data).
2. Use electric pump to fill engine with oil from new-oil tank until the "max." mark on the oil dipstick is reached.
3. Check engine oil level (→ Page 156).

TIM-ID: 0000006160 - 001

6.7.3 Engine oil – Sampling and analysis

Preconditions

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
MTU test kit	5605892099/00	1

DANGER

Unguarded rotating and moving engine components.
Risk of serious injury – danger to life!
- Take special care when working on a running engine.

WARNING

Hot oil.
Oil can contain combustion residues which are harmful to health.
Risk of injury and poisoning!
- Wear protective clothing, gloves, and goggles / safety mask.
- Avoid contact with skin.
- Do not inhale oil vapor.

WARNING

Engine noise above 85 dB (A).
Risk of damage to hearing!
- Wear ear protectors.

Engine oil – Sample extraction and analysis

1. Connect sampling hose (unit manufacturer scope of delivery) to sampling neck (arrowed) with engine running at operating temperature.
2. Drain approx. 0.5 liter engine oil into a clean container.
3. Using the equipment and chemicals of the MTU test kit, examine engine oil for:
   - Dispersing capacity (spot test);
   - Water content.

TIM-ID: 0000014117 - 001

6.8 Oil Filtration / Cooling

6.8.1 Engine oil filter – Replacement

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

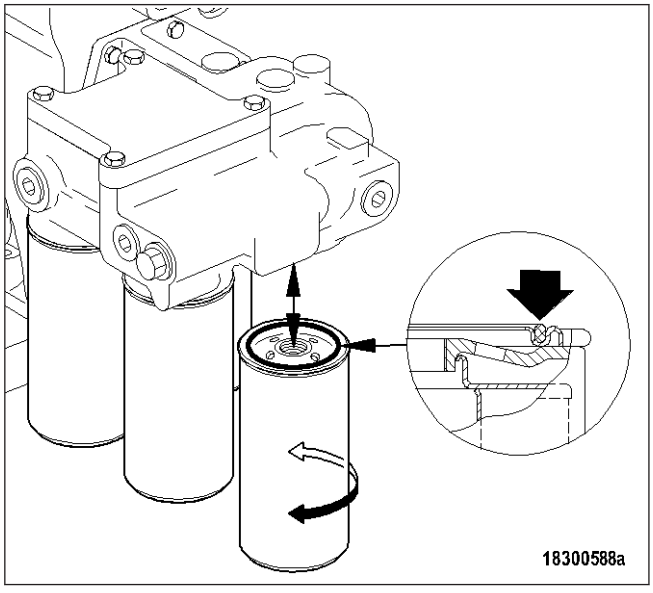
Designation / Use	Part No.	Qty.
Filter wrench	F30379104	1
Engine oil		
Oil filter	(→ Spare Parts Catalog)	

WARNING

Hot oil.
Oil can contain combustion residues which are harmful to health.
Risk of injury and poisoning!
- Wear protective clothing, gloves, and goggles / safety mask.
- Avoid contact with skin.
- Do not inhale oil vapor.

Engine oil filter – Replacement

1. Remove oil filter with filter wrench.
2. Clean the sealing face on the adapter.
3. Check condition of new oil filter sealing ring and coat it with oil.
4. Screw on and tighten new engine oil filter by hand.
5. Replace other engine oil filters in the same way.
6. Check engine oil level (→ Page 156).



TIM-ID: 0000006398 - 002

6.9 Coolant Circuit, General, High-Temperature Circuit

6.9.1 Engine coolant – Level check

Preconditions

☑ Engine is stopped and starting disabled.

☑ MTU Fluids and Lubricants Specification (A001061/..) is available.

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

Engine coolant – Level check

1. Read off system pressure at pressure gauge, for system pressure (→ Product Summary - Technical Data).
2. If required, top up with treated coolant (→ Page 164).

TIM-ID: 0000006768 - 001

6.9.2 Engine coolant – Change

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Coolant		

Engine coolant – Change

1. Drain engine coolant (→ Page 162).
2. Fill with engine coolant (→ Page 164).

TIM-ID: 0000000036 - 030

6.9.3 Engine coolant – Draining

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Sealing ring	(→ Spare Parts Catalog)	

WARNING

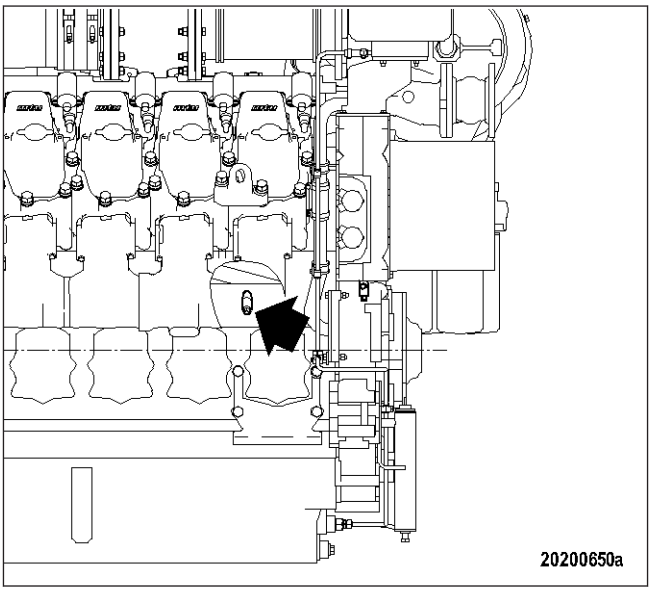
Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

Preparatory steps

1. Provide an appropriate container to drain the coolant into.
2. Switch off preheating unit if installed.

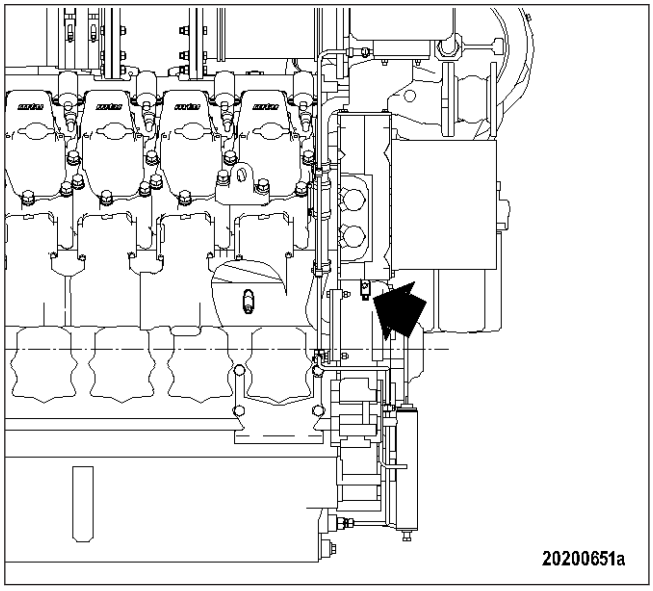
Engine coolant – Draining

1. Open drain valves and drain coolant at the following points:
   - At the crankcase free end, LHS and RHS



TIM-ID: 0000006751 - 001

2. Draining of residual coolant:
   - At coolant distribution housing.
3. Close all open drain points.



TIM-ID: 0000006751 - 001

6.9.4 Engine coolant – Filling

Preconditions

☑ Engine is stopped and starting disabled.

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Engine coolant		

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

CAUTION

Cold coolant in hot engine can cause thermal stress.
Formation of cracks in components!
- Fill / top up coolant only into cold engine.

Engine coolant filling

1. Fill with treated coolant until the specified system pressure (→ Product Summary - Technical Data) is provided.
2. Vent engine coolant circuit (see documentation of genset manufacturer).
3. Start the engine and operate it at idle speed for some minutes.
4. Check coolant level (→ Page 160) and top up if required.

TIM-ID: 0000014575 - 001

6.9.5 Vent line of engine coolant circuit – Replacement

Preconditions

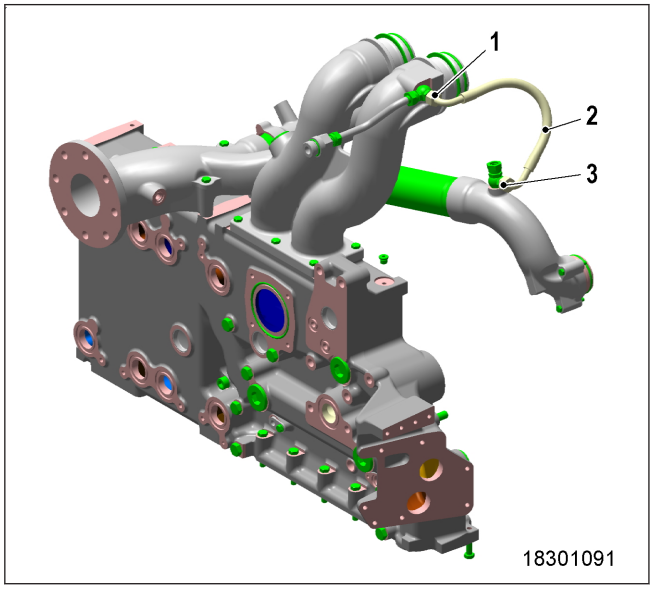
☑ Engine is stopped and starting disabled.

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

Replacing coolant vent line

1. Drain engine coolant (→ Page 162).
2. Release union nuts (1) and (3).
3. Remove coolant vent line (2).
4. Install new coolant vent line (2).
5. Fill with engine coolant (→ Page 164).



TIM-ID: 0000029143 - 002

6.10 Low-Temperature Circuit

6.10.1 Mixture coolant level - Check

Preconditions

☑ Engine shut down and starting disabled.

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

Checking mixture coolant level

1. Read off system pressure at pressure gauge, for system pressure (→ Product Summary - Technical Data).
2. Top up with treated coolant as necessary (→ Page 169).

TIM-ID: 0000007032 - 002

6.10.2 Mixture coolant - Change

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Mixture coolant		

Drain mixture coolant .

▶ (→ Page 168)

Fill mixture coolant system .

▶ (→ Page 169)

TIM-ID: 0000007027 - 002

6.10.3 Mixture coolant - Draining

Preconditions

☑ Engine shut down and starting disabled.

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

Draining charge-air coolant

1. Provide a suitable receptacle to catch the coolant.
2. Open drain valve in the coolant line to the mixture cooler (see documentation of genset manufacturer) and drain coolant.

TIM-ID: 0000007024 - 002

6.10.4 Mixture coolant - Filling

Preconditions

☑ Engine shut down and starting disabled.

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Mixture coolant		

WARNING

Coolant is hot and under pressure.
Risk of injury and scalding!
- Let the engine cool down.
- Wear protective clothing, gloves, and goggles / safety mask.

CAUTION

Cold coolant in hot engine can cause thermal stress.
Formation of cracks in components!
- Fill / top up coolant only into cold engine.

Filling with coolant

1. Fill with treated coolant until the specified system pressure (→ Product Summary - Technical Data) is provided.
2. Vent mixture coolant circuit (see documentation of genset manufacturer).
3. Start the engine and operate it at idle speed for some minutes.
4. Check coolant level (→ Page 166) and top up engine coolant as required.

TIM-ID: 0000014853 - 002

6.11 Wiring (General) for Engine/Gearbox/Unit

6.11.1 Engine wiring – Check

Preconditions

☑ Engine is stopped and starting disabled.

Special tools, Material, Spare parts

Designation / Use	Part No.	Qty.
Isopropyl alcohol	X00058037	1

Engine wiring – Check

1. Check securing screws of cable clamps on engine and tighten loose threaded connections.
2. Ensure that cables are fixed in their clamps and cannot swing freely.
3. Check that cable ties are firm, tighten loose cable ties.
4. Replace faulty cable ties.
5. Visually inspect the following electrical line components for damage:
   - connector housings;
   - contacts;
   - sockets;
   - cables and terminals;
   - plug-in contacts.
6. (→ Contact Service) if cable conductors are damaged.

Note: Close male connectors that are not plugged in with the protective cap supplied.

7. Clean dirty connector housings, sockets and contacts with isopropyl alcohol.
8. Ensure that all sensor connectors are securely engaged.

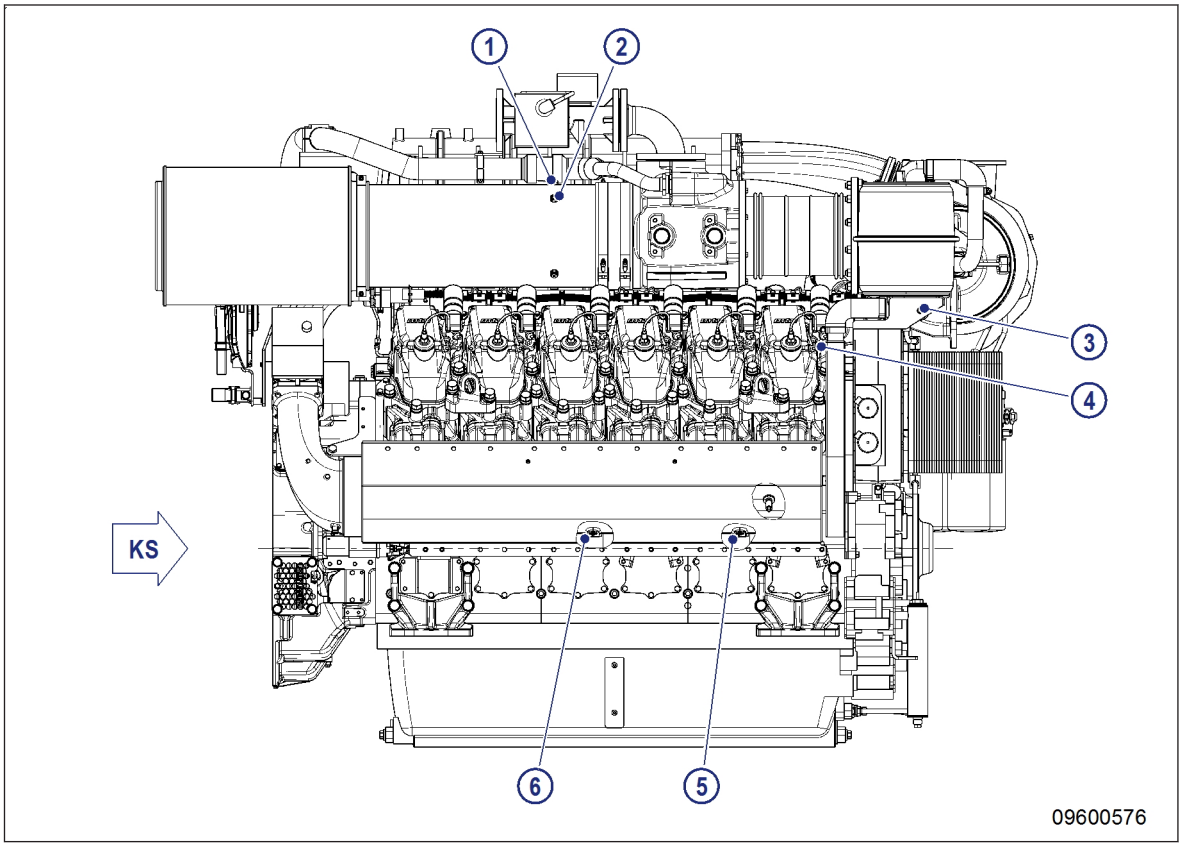
TIM-ID: 0000000029 - 018

6.11.2 Sensors – Overview

Sensors on right engine side

Deviations from illustrations are insignificant.

Figures apply in the same way also to 8 V and 16 V.



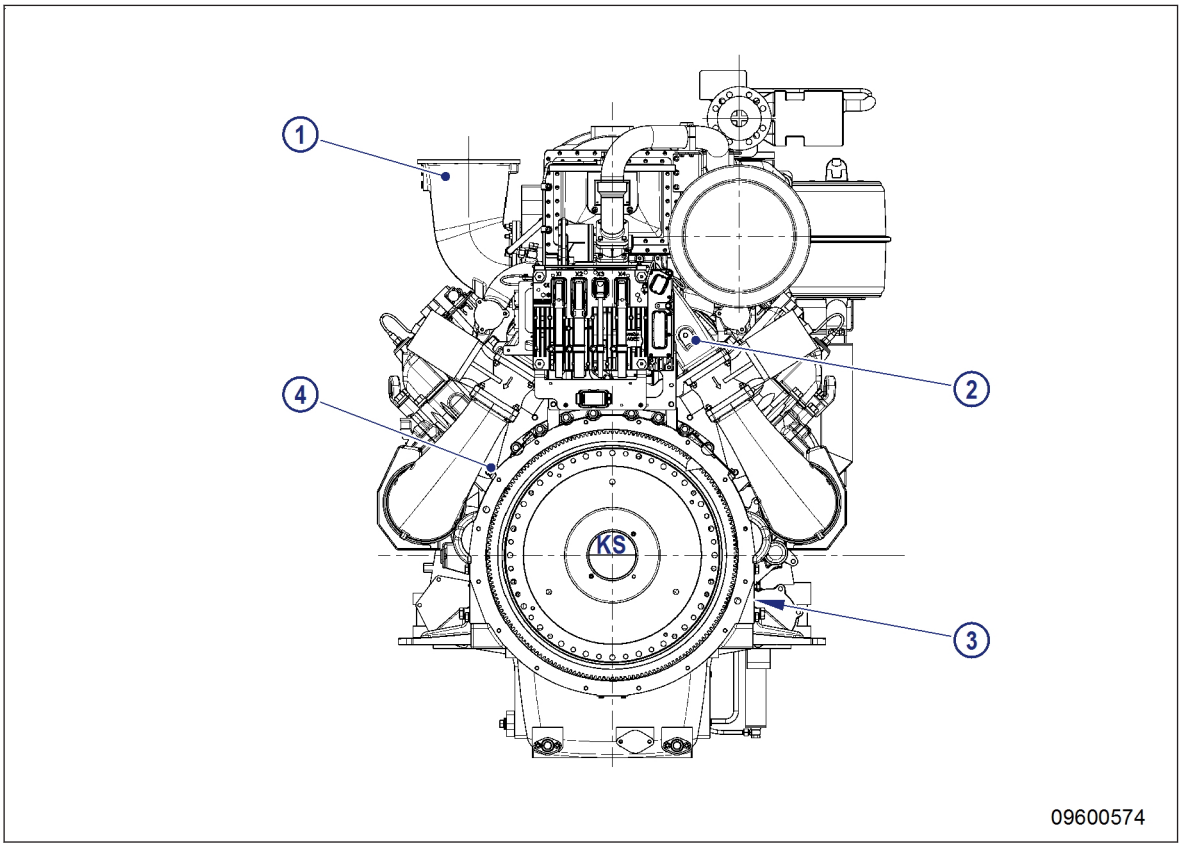
Item	Designation	Monitoring of
1	B49.2	Intake air temperature
2	B81.2	Intake air pressure after filter
3	B16.1	Coolant pressure after engine
4	B4.XX	Exhaust gas temperature after cylinder XX
5	B79.22	Mixture pressure B-side
6	B73	Mixture temperature

Table 33: Sensors on right engine side

The knocking sensors (B80.XX) are arranged on the crankcase (right and left) below the cylinder heads.

TIM-ID: 0000036119 - 002

Sensors on engine driving end

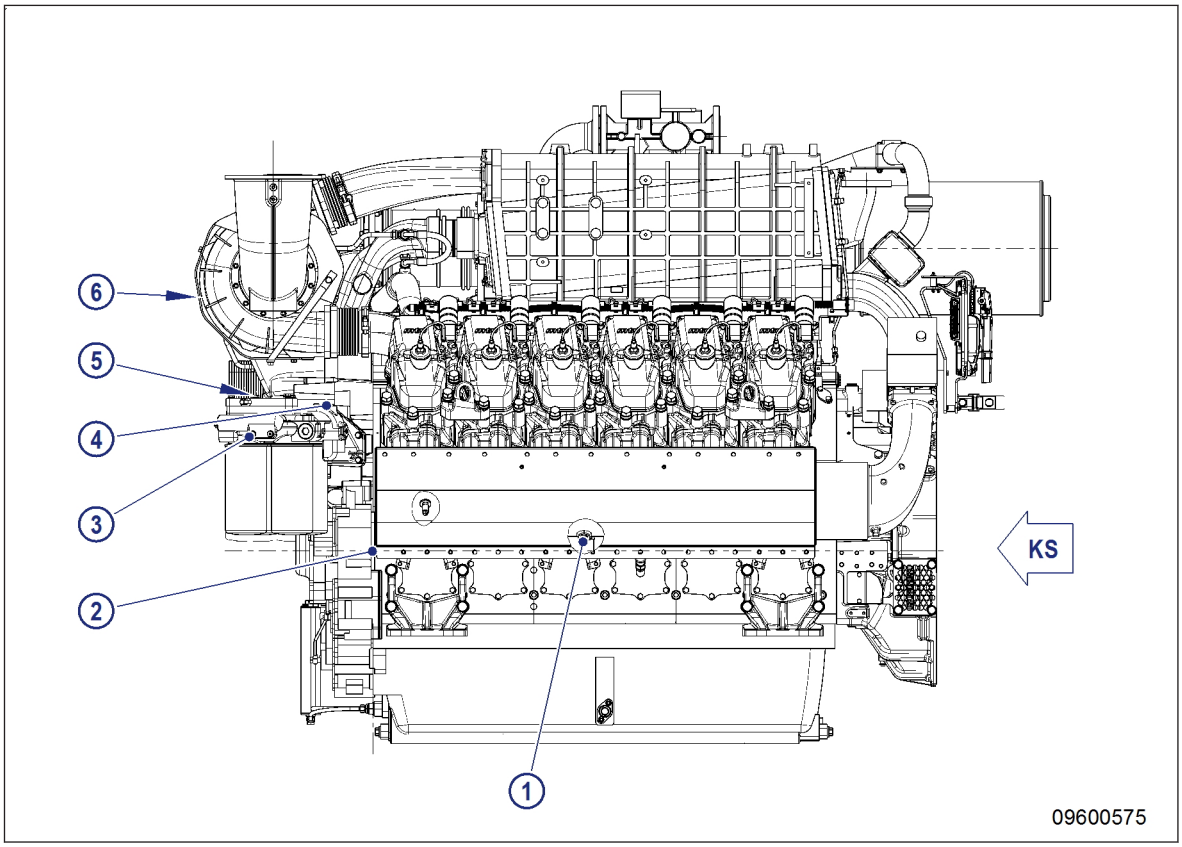


Item	Designation	Monitoring of
1	B79.23	Mixture pressure before throttle
2	B75	Crankshaft speed, reset ignition system
3	B13.2	Crankshaft speed ignition

Table 34: Sensors on engine driving end

TIM-ID: 0000036119 - 002

Sensors on left engine side

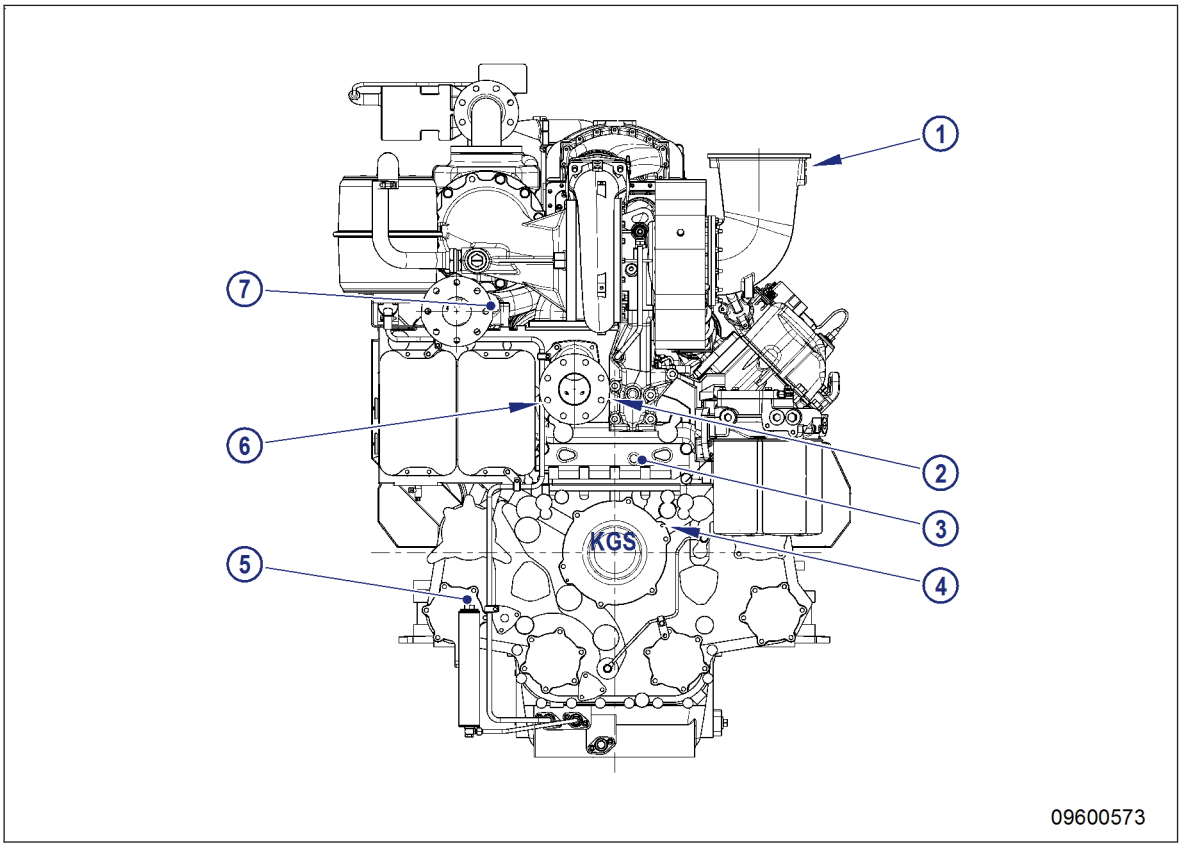


Item	Designation	Monitoring of
1	B4.21	Exhaust bulk temperature after turbocharger
2	B79.21	Mixture pressure A-side
3	B50	Crankcase pressure
4	B5.3	Engine oil pressure before filter
5	B7	Engine oil temperature
6	B5.1	Engine oil pressure after filter

Table 35: Sensors on left engine side

TIM-ID: 0000036119 - 002

Sensors on engine free end



Item	Designation	Monitoring of
1	B16.3	Coolant pressure before engine
2	B1.3	Camshaft speed for anti-knock control
3	B1.1	Camshaft speed for engine governor
4	B24	Engine oil level
5	B1.2	Camshaft speed for ignition system
6	B6.3	Coolant temperature before engine
7	B6.1	Coolant temperature after engine

Table 36: Sensors on engine free end

TIM-ID: 0000036119 - 002

7 Appendix A

7.1 Abbreviations

Abbreviation	Meaning	Explanation
AL	Alarm	Alarm message
ANSI	American National Standards Institute	Association of American standardization organizations
ETC	Exhaust turbocharger	
BR	Series	
BV	Fluids and Lubricants Specifications	MTU Publication No. A01061/..
CAN	Controller Area Network	Data bus system, bus standard
CKT	Circuit	
DIN	Deutsches Institut für Normung e. V.	At the same time identifier of German standards
DL	Default Lost	Alarm: Default CAN bus failure
ECU	Engine Control Unit	Engine governor
EMU	Engine Monitoring Unit	Monitoring unit for engine
SPC	Spare Parts Catalog	
HI	High	Alarm: Measured value exceeds 1st maximum limit value
HIHI	High High	Alarm: Measured value exceeds 2nd maximum limit value
HT	High Temperature	High temperature
ICFN	ISO - Continuous - Fuel stop - brake power	Fuel stop power ISO International coding for power output of combustion engines
ISO	International Organization for Standardization	International umbrella organization for all national standardization institutes
KGS	Kraftgegenseite	Engine free end in accordance with DIN ISO 1204
KS	Kraftseite	Engine driving end in accordance with DIN ISO 1204
LED	Light Emitting Diode	Light emitting diode
LO	Low	Alarm: Measured value lower than 1st minimum limit value
LOLO	Low Low	Alarm: Measured value lower than 2nd minimum limit value
MD	Missing Data	A measuring point does not provide data.
MG	Message	General message
LT	Low temperature	
OEM	Original Equipment Manufacturer	
TDC	Top Dead Center	
PAN	Panel	Control panel

TIM-ID: 0000009960 - 002

Abbreviation	Meaning	Explanation
PIM	Peripheral Interface Module	Peripheral interface module
PWM	Pulse Width Modulation	Modulated signal
RL	Redundancy Lost	Alarm: Redundant CAN bus failure
SAE	Society of Automotive Engineers	U.S. standardization organization
SD	Sensor Defect	Alarm: Sensor failure
SS	Safety System	Safety system alarm
TA-Luft	Technische Anleitung zur Reinhaltung der Luft	General administrative instruction for federal emission control law in Germany
TD	Transmitter Deviation	Alarm: Sensor comparison fault
BDC	Bottom Dead Center	
TC	Tool Catalog	
ZZP	Ignition timing	

TIM-ID: 0000009960 - 002

7.2 MTU Onsite Energy contact / service partner

Service

The worldwide network of the sales organization with subsidiaries, sales offices, representatives and customer service centers ensure fast and direct support on site and ensure the high availability of our products.

Local Support

Experienced and qualified specialists place their knowledge and expertise at your disposal.

For our locally available support, go to MTU's Internet site: http://www.mtu-online.com/mtuonsiteenergy/kontakt

24h Hotline

With our 24h hotline and the flexibility of our service staff, we are always ready to assist you - either during operation, for preventive maintenance, corrective work in case of malfunction or changed operating conditions, or for spare parts supply.

Your contact at Headquarters: service-oeg@mtu-online.com

Spare Parts Service

Quick, easy and correct identification of the spare part required for your system. The right spare part at the right time at the right place.

With this aim in mind, we can call on a globally networked spares logistics system.

Your contact at Headquarters:

E-mail: spareparts-oeg@mtu-online.com

Germany:
- Tel.: 0800 5633000
- Fax: 0800 5644000

Worldwide:
- Tel.: +49 821 7480331
- Fax: +49 821 7480288

TIM-ID: 0000002624 - 002

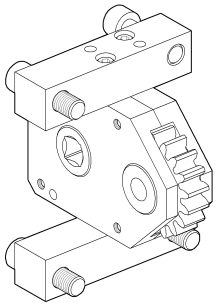
8 Appendix B

8.1 Special Tools

Angular screw driver

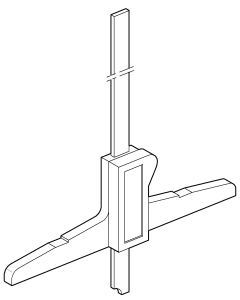
Part No.:	F30452765
Qty.:	1
Used in:	6.4.3 Valve clearance - Check and adjustment (→ Page 148)

Barring tool



Part No.:	F6555766
Qty.:	1
Used in:	6.1.1 Engine – Barring manually (→ Page 133)

Depth gauge



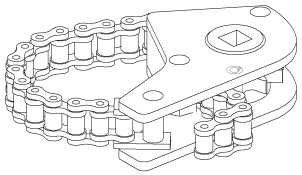
Part No.:	Y20095775
Qty.:	1
Used in:	6.4.2 Valve depth – Measurement (→ Page 145)

Feeler gauge

Part No.:	Y20098771
Qty.:	1
Used in:	6.4.3 Valve clearance - Check and adjustment (→ Page 148)

DCL-ID: 0000016352 - 003

Filter wrench



Part No.:	F30379104
Qty.:	1
Used in:	6.8.1 Engine oil filter – Replacement (→ Page 159)

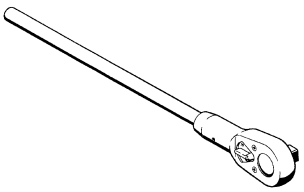
Gas detection and alarm unit

Part No.:	
Qty.:	
Used in:	6.1.2 Checking machine room for smell of gas (→ Page 134)

MTU test kit

Part No.:	5605892099/00
Qty.:	1
Used in:	6.7.3 Engine oil – Sampling and analysis (→ Page 158)

Ratchet head with extension



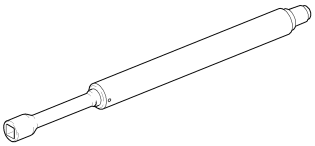
Part No.:	F30006212
Qty.:	1
Used in:	6.1.1 Engine – Barring manually (→ Page 133)

DCL-ID: 0000016352 - 003

Socket wrench, 24 mm

Part No.:	F30029815
Qty.:	1
Used in:	6.4.3 Valve clearance - Check and adjustment (→ Page 148)

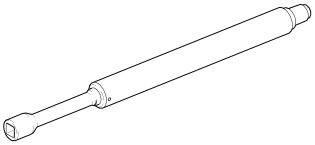
Spark plug socket wrench, 20.8 mm



F30452574

Part No.:	F30452574
Qty.:	1
Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)

Spark plug wrench



F30452574

Part No.:	F30452574
Qty.:	1
Used in:	6.3.3 Spark plug connector – Removal and installation (→ Page 139)

Stroboscope

Part No.:	
Qty.:	
Used in:	6.3.1 Ignition system – Ignition timing check (→ Page 137)

Torque wrench, 10-60 Nm

Part No.:	F30452769
Qty.:	1
Used in:	6.3.3 Spark plug connector – Removal and installation (→ Page 139)
Qty.:	1
Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)

DCL-ID: 0000016352 - 003

Torque wrench, 60-320 Nm

Part No.:	F30452768
Qty.:	1
Used in:	6.4.3 Valve clearance - Check and adjustment (→ Page 148)

DCL-ID: 0000016352 - 003

8.2 Consumables

Assembly compound (Molykote P 37)	
Part No.:	50564
Qty.: Used in:	1 6.3.5 Spark plug – Removal and installation (→ Page 142)

Coolant	
Part No.:	
Qty.: Used in:	 6.9.2 Engine coolant – Change (→ Page 161)

Engine coolant	
Part No.:	
Qty.: Used in:	 6.9.4 Engine coolant – Filling (→ Page 164)

Engine oil	
Part No.:	
Qty.: Used in:	 6.4.1 Valve gear – Lubrication (→ Page 144)
Qty.: Used in:	 6.4.3 Valve clearance - Check and adjustment (→ Page 148)
Qty.: Used in:	 6.4.4 Valve gear – Lubrication (→ Page 151)
Qty.: Used in:	 6.7.2 Engine oil – Change (→ Page 157)
Qty.: Used in:	 6.8.1 Engine oil filter – Replacement (→ Page 159)

Isopropyl alcohol	
Part No.:	X00058037
Qty.: Used in:	1 6.11.1 Engine wiring – Check (→ Page 170)

Leakage detection spray	
Part No.:	
Qty.: Used in:	 6.5.1 Gas supply – Checking gas lines for leaks (→ Page 153)

Mixture coolant	
Part No.:	
Qty.: Used in:	 6.10.2 Mixture coolant - Change (→ Page 167)
Qty.: Used in:	 6.10.4 Mixture coolant - Filling (→ Page 169)

DCL-ID: 0000016352 - 003

Soap solution	
Part No.:	
Qty.: Used in:	6.5.1 Gas supply – Checking gas lines for leaks (→ Page 153)

DCL-ID: 0000016352 - 003

8.3 Spare Parts

Air filter	
Part No.:	
Qty.: Used in:	6.6.1 Air filter – Replacement (→ Page 154)

Filter insert	
Part No.:	
Qty.: Used in:	6.2.1 Oil separator – Filter replacement (→ Page 135)

Fleece prefilter (optional)	
Part No.:	
Qty.: Used in:	6.6.1 Air filter – Replacement (→ Page 154)

Gasket	
Part No.:	
Qty.: Used in:	6.4.5 Cylinder head cover – Removal and installation (→ Page 152)

Locking plate	
Part No.:	
Qty.: Used in:	6.3.3 Spark plug connector – Removal and installation (→ Page 139)
Qty.: Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)

O-ring	
Part No.:	
Qty.: Used in:	6.2.1 Oil separator – Filter replacement (→ Page 135)
Qty.: Used in:	6.2.1 Oil separator – Filter replacement (→ Page 135)

Oil filter	
Part No.:	
Qty.: Used in:	6.8.1 Engine oil filter – Replacement (→ Page 159)

DCL-ID: 0000016352 - 003

Sealing ring	
Part No.:	
Qty.: Used in:	6.2.1 Oil separator – Filter replacement (→ Page 135)
Qty.: Used in:	6.3.3 Spark plug connector – Removal and installation (→ Page 139)
Qty.: Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)
Qty.: Used in:	6.9.3 Engine coolant – Draining (→ Page 162)

Spark plug	
Part No.:	
Qty.: Used in:	6.3.4 Spark plug – Replacement (→ Page 141)
Qty.: Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)

Spark plug connector	
Part No.:	
Qty.: Used in:	6.3.2 Spark plug connector – Replacement (→ Page 138)

Spark plug connector with ignition cable	
Part No.:	
Qty.: Used in:	6.3.5 Spark plug – Removal and installation (→ Page 142)

Spark plug connector with ignition line	
Part No.:	
Qty.: Used in:	6.3.3 Spark plug connector – Removal and installation (→ Page 139)

DCL-ID: 0000016352 - 003

8.4 Index

12 V 4000 L62, 16 V 4000 L62 engine data, fuel optimized (TA-Luft) 22
12V 4000 L62, 16V 4000 L62 engine data, emissions-optimized (1/2 TA-Luft) 26
50-hours check 46

A

Abbreviations 175
After stopping the engine – Engine remains ready for operation 44
After stopping the engine – Putting the engine out of operation 45
Air filter
– Installation 155
– Removal 155
Air filter – Replacement 154

C

Checking machine room for smell of gas 134
Control cabinet MIS – Overview 32
Control, starting and stopping sequences 39
Cylinder
– Designation 18
Cylinder head cover
– Removal and installation 152

E

Emergency stop 43
Engine
– Main dimensions 19
– Wiring check 170
Engine coolant
– Change 161
Engine coolant – Draining 162
Engine coolant – Filling 164
Engine coolant – Level check 160
Engine governor – Fault messages 102
Engine oil filter – Replacement 159
Engine oil level
– Check 156
Engine oil – Change 157
Engine oil – Sampling and analysis 158
Engine side
– Designation 18
Engine wiring
– Check 170
Engine – Barring manually 133
Engine – Overview 16

F

Fault indication on SAM display 48
Fire and environmental protection 12
Fluids and lubricants 12

G

Gas engine phase 3 system
– Overview 30
Gas supply – Checking gas lines for leaks 153
General conditions 5

I

Ignition order 20
Ignition system
– Ignition timing check 137

M

Maintenance and repair work
– Safety requirements 9
Mixture coolant
– Draining 168
– Filling 169
– Replacement 167
Mixture coolant level
– Check 166
MTU Onsite Energy contact / service partner 177

O

Oil separator
– Filter replacement 135
Operation
– Safety regulations 8
Operational checks 41

P

Personnel and organizational requirements 6
Purpose of the units 33
Putting the engine into operation after extended out-of-service-periods (>3 months) 37
Putting the engine into operation after scheduled out-of-service-period 38

R

Runtimes at partial load 21

S

Safety instructions 15
Safety regulations 8
SAM – Fault messages 52
Sensors
– Overview 171
Spark plug
– Removal and installation 142
Spark plug connector
– Removal and Installation 139
– Replacement 138
Spark plug – Replacement 141
Starting the engine 40
Startup
– Safety regulations 8
Stopping the engine 42

DCL-ID: 0000016352 - 003

T

Transport 7

V

Valve clearance - Check and adjustment 148
Valve depth
– Measurement 145
Valve gear
– Lubrication 144, 151
Vent line of engine coolant circuit
– Replacement 165

W

Wiring - engine
– Check 170

DCL-ID: 0000016352 - 003